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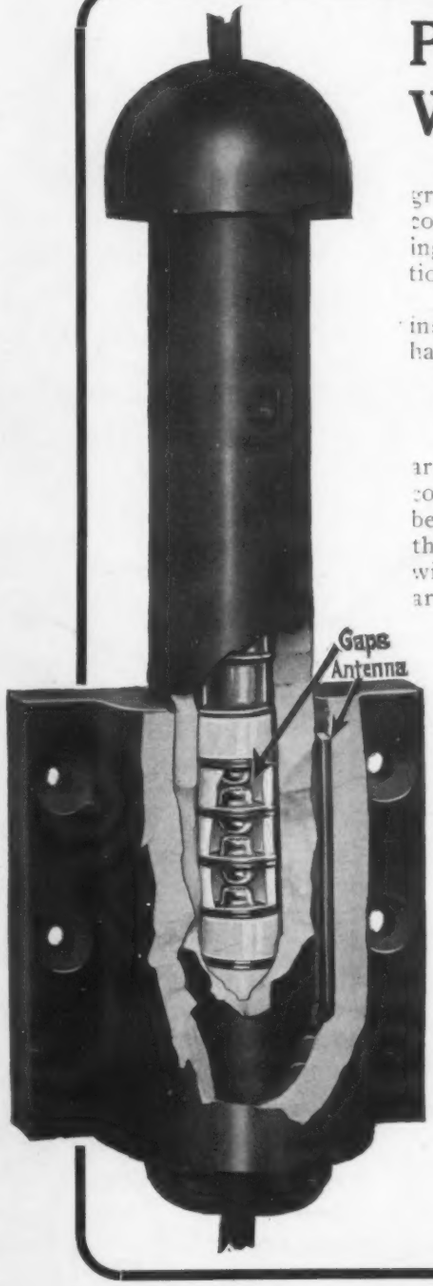

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The insulating case is of porcelain, with all joints filled with weatherproof insulating compound. This feature does away with the necessity of enclosing the arrester in a box, and aids considerably in reducing the cost.

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Where to Buy It in the West, Pages 9, 10, 12. **Alphabetical Index to Advertisers, Page 8.**

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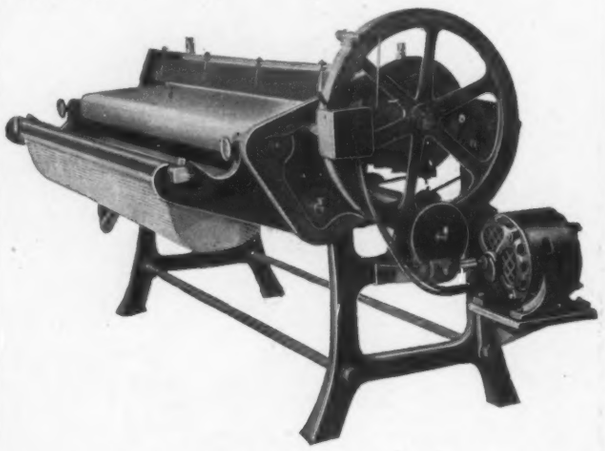

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POWER AND GAS
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ELECTRIC DRIVE IN A COLORADO LUMBER MILL

BY R. B. MATEER.

Timber lands are found in all parts of the United States. Nature provided for the growth of the tree. Man felled the tree and by mechanical operations converted the tree into a useful product suitable for human needs.

To produce the lumber for a home, economy has not been the watchword. Lumber camps were established in the forest and the tree, by wasteful methods, converted into rough lumber. The bark, the butt ends and in many cases valuable pieces of timber were used for the production of power. The cost of the power produced was high and today is further increased as the timber lands are rapidly denuded for the needs of man.

Many claim, and will continue to, that butt ends, slabs and scrub timber are not expensive as a fuel to produce power for the sawing of timber, but the educational campaign waged for the conservation of our natural products and their economical use continues with excellent results.

On the mountain ranges of Colorado is found much scrub timber. A commercial use for it was desired. Several enterprising men, noting the demand for boxes and crates, conceived the idea of using scrub timber for such crates and cases. A mill for this purpose was planned and steam, as a motive, contemplated. The refuse was intended for fuel.

An electric company, always on the lookout for an opportunity to secure a good day load, is operating in the same city in which the mill was to be located. Numerous conferences between the projectors of the mill and the power engineer of the electric company resulted in the use of electric power.

Motor Driven Mill and Yards of Western Box & Lumber Company.

Central station current transmitted at 2200 volts and then stepped down to 220 volts, now operates the plant, which today is using scrub timber and supplying many of the mercantile establishments with packing cases and crates.

Very little waste is found in this plant, which is modern in every detail. The timbers, 6 in. in diameter and 8 to 9 ft. in length, are brought to Denver by the Moffat Road. The car is switched to the Western Box & Lumber Company's mill, where the logs are unloaded and after being cut to 8 ft. lengths, are one by

one fed to an automatic saw, operated by a 50 h.p. General Electric three-phase motor. Here boards of any desired thickness are cut. The boards then pass through a sizing machine, which removes the rough edges and bark.

Motor Directly Connected to Saw.

Interior View of Electrically Driven Mill.

Loaded on trucks, the boards are carried to the main building, where the planer, band saw and other machinery are operating, all of which machines result in the finished case or box.

A 20 h.p. General Electric motor operates the "Mershon" band saw, while a 25 h.p. General Electric motor operates the 26 in. "American" planer. The two cut-off saws, the two rip saws, a combination saw, a pony planer, a single re-saw, a matcher, the nailing and printing machine, are all belted to a line shaft operated by a 40 h.p. Fairbanks-Morse motor. All operations are by motor drive from the 5 h.p. on the cut-off saw to the 40 and 50 h.p. motors used in producing the finished crate or packing case.

But what of the waste or refuse, consisting of the butt ends, the shavings and sawdust? All are converted into good money. The butt-ends are sold to a wood dealer, who cuts them into suitable size, then sacks the kindling and finds a ready market. The slabs are easily sold to brick manufacturers in suitable lengths for furnace fuel. No waste so far.

The line shafting, the planer and large saws are each equipped with a blower, which drives the shavings and sawdust over screens and into proper bins. The shavings are disposed of for packing, where delicate articles need protection from the sides of packing cases. The livery men use all the shavings they can secure. Still no waste.

The sawdust. Well, it was somewhat of a problem. Yet a powder mill was found to be operating, not too far from Denver, and sawdust was needed. What was simpler than to switch a box car on the siding and fill it and then ship the car and contents to the powder plant. Then some ice is stored in winter and some sawdust is needed. Some goods, when packed, are protected from breakage by the use of sawdust.

To study a prospective consumer's needs; to determine how best to secure economy and efficiency of operation for the consumer; to look about for a market whereby the customer may dispose of his by-product, that by-product which undisposed of is a menace to your plans; to urge and secure an outlay of money for electrical machinery and to make, above all, the consumer a satisfied one, gave our electric company a customer; yes more, a booster for electric power.

PRESIDENT TAFT RECOMMENDS A PATENT COMMISSION.

The patent situation has received important recognition from President Taft, who recently transmitted a special message to Congress asking for authority to appoint a commission to investigate the patent laws and report what changes are necessary to make them fit modern conditions. He refers in the message to a number of the more glaring abuses under the present system and particularly to the creation of such monopolies as were upheld by the now famous decision of the Supreme Court in the Dick case, saying that it is worthy of the most careful consideration whether or not legislation should be enacted to prevent the patent laws from creating an unjust monopoly beyond the protection to inventors which is so vitally necessary for the promotion of the arts and sciences, or to prevent these laws from being the means, on the other hand, of stifling progress and invention. The President also points out that any revision should not unduly interfere with the vested interests which have been built up under the present system, nor impair in any way the great value of this system to the country as a whole. He urges further that procedure under the patent laws be simplified and that the burden of proof in cases of contested validity be imposed upon the infringing party. The President's action in this matter is most timely and bespeaks an attitude which must inevitably be a source of great satisfaction to inventors and the general public the whole country over.

THE RELATION OF THE ENGINEER TO CONSTRUCTIVE CITIZENSHIP.

BY LESTER S. READY.

The past fifty years has been a period of enormous industrial development. Great transportation systems have grown, until now in America, every hamlet is connected with the large centers of industry. Electric generating and transmission systems have been devised and extended until at the present time they are among the largest factors in industrial civilization. Telephone and telegraph systems span the country from ocean to ocean, so that, as far as the transmission of intelligence is concerned distances are merely nominal.

Development nowadays is not by individual enterprise alone. Many of the problems to be solved by the engineer are placed in his hands by large corporate interests, the activities of which are of vital importance to the welfare of the people.

For a number of years the public has clung to the belief that the greatest economy would result from unlimited competition. They feared monopolies. Time seems, however, to have somewhat modified this original conviction. Those who are best qualified to judge of such matters have demonstrated that where duplication of investment and administration results, competition does not long remain effective. The truth of this conclusion has been exemplified in more than one great public utility.

In many instances, such as transportation, telephone, gas and electric power systems, it has been found that to obtain the greatest ultimate economy and therefore the best service at the lowest rates one comprehensive investment properly managed and operated must be maintained. Recognizing this, the government has appointed commissioners for the purpose of regulating and controlling the operation of such enterprises for the protection of the people.

The activities of controlling bodies, such as the Interstate Commerce Commission, and the many state public utility commissions have resulted where wisely carrried out, in improved service to the people and in protection to the corporate interests themselves.

A beginning has been made. The conditions and requirements of the people as well as of the corporations, however, must be more thoroughly studied in order that all phases of the subject may be fully understood and justice administered to every one.

To a large extent in the past the investigation leading to the control of these matters has been carried out by lawyers and practically trained business men. The representatives of the people have been slow to recognize that to cope with the intricate problems presented it is necessary to have specific as well as general knowledge of the engineering details involved. The assistance, therefore, and the advice of properly trained engineers is absolutely necessary to the success of all such public undertakings.

The great development along industrial lines has been due to a large degree to the engineering profession and now that the work of the engineer is changing from invention and construction to consideration of economic problems, it follows that the responsibility of the engineer to his employer and to the people should be based on broader civic principles.

No individual has a better opportunity to understand details or is more competent to advise than the properly trained engineer. He is not only fully aware of the service that should be given to the people, and the technical difficulties to be overcome, but he is also aware of the eternal vigilance necessary to the success of great public undertakings.

Such an engineer will not make his recommendations until all the facts have been established and the problem fully and carefully considered. His work has taught him that serious disasters may result if action is taken with insufficient data at hand.

The successful engineer knows the business conditions of the community as well as the financial possibilities governing the management of public utilities and he therefore can the more fully understand the necessities of the case.

The young engineer of today is in a unique position. With the knowledge of his profession, of business and its details, and with more than the ordinary acquaintance with the contemporary problems in his field he must realize that as a citizen his responsibility is great. As the designer and constructor of important engineering works he should materially assist in bringing about the highest possible economic development. No matter by whom employed he should bear in mind that while serving his employer he must as loyally serve the state and the community. In the work of his profession it is within his power to influence and establish that spirit of co-operation between corporate interests and the people without which no true success is possible. And by the exercise of clear thinking and unprejudiced judgment he may thus become a power in the development of constructive citizenship.

SUGGESTIONS ON STORING COAL.

With full appreciation of the fact that any or all of the following suggested precautions may prove impracticable or unreasonably expensive under certain conditions, they are offered by the Bureau of mines as advisable for safety in storing bituminous coal:

1. Do not pile over 12 feet deep, nor so that any point in the interior of a pile will be over 10 feet from an air-cooled surface.
2. If possible, store only screened lump coal.
3. Keep out dust as much as possible; to this end reduce handling to a minimum.
4. Pile so that lump and fine are distributed as evenly as possible; not, as is often done, allowing lumps to roll down from the peak and form air passages at the bottom of the pile.
5. Rehandle and screen after two months, if practicable.
6. Do not store near external sources of heat, even though the heat transmitted be moderate.
7. Allow six weeks' "seasoning" after mining and before storing.
8. Avoid alternate wetting and drying.
9. Avoid admission of air to interior of pile through interstices around foreign objects, such as timbers or irregular brickwork, or through porous bottoms, such as coarse cinders.
10. Do not try to ventilate by pipes, or more harm may often be done than good.

SOME FEATURES OF THE DESIGN AND CONSTRUCTION OF DYNAMO ELECTRIC MACHINES.[1]

BY CARL E. JOHNSON.

Direct Current Machines—I.

Direct current motors, as we all know, are made shunt, series and compound wound. Although the operating characteristics are different the design and construction of each is about the same, so the following features briefly mentioned may be considered to cover all types.

Starting with the direct current armature designed mechanically right, we have our choice of using closed or open slots in which to place our windings.

Closed slots are used because they partially effect noiseless operation, afford a better distribution of the magnetic flux, and allow the use of a smaller air gap which is a decided advantage, especially in the smaller machines. The uniform and even distribution of flux minimize eddy currents in the poles. Then again in the use of closed slots are the elimination of the banding wires with their attendant troubles. The principal objection to the closed slot is the higher self induction in the short circuited coils, not to mention from the construction standpoint the physical difficulty of insulating in the slots, the bottom from the top of the winding. While open slots offer poor distribution of flux, this feature is off-set by the insulation obtainable and necessary in larger machines due to increased mechanical stress on the windings and for this reason are more generally used.

The selection of a given type of winding is only done after giving careful consideration to the desired preference, mechanical stresses and details after which the general arrangement is laid out.

It is always desirable to use a minimum amount of copper and to compactly arrange it in a minimum space, not losing sight of the necessity for ventilation. This is true of most all types of electrical machinery.

In direct current armatures the number of coils and slots, of which there usually are a large number to select from, each have their effect in determining the nature of the coils employed and the laying out of the winding scheme. In these, two types of windings are principally used which are known as multiple or lap windings and series two circuit or wave windings.

In the two circuit winding there are but two paths for current through the armature regardless of the number of poles and half of the total coils are connected in series in each path.

The lap or multiple winding has as many paths as there are poles and a corresponding smaller number of coils in series. As an example in two 4-pole machines, both of the same size, type and rating, if one is designed to be lap wound and the other wave wound, the wave connected armature would have only one-half as many conductors each of double cross sections in its periphery as the lap wound. Thus, it will be seen on small machines when the number of turns is necessarily limited the wave winding is usually much cheaper and easier to install. Another favorable feature of the wave winding is its ability to take care of unequal voltages in different sets of coils due to unequal gaps, wear in bearings, poor contact in some of the brushes, etc. With wave windings it is possible to use two sets of brushes, bearing in mind they must be of sufficient cross section to give proper current density at area of contact.

In some armatures of both multiple or series parallel winding cross connections are sometimes used. These can be arranged either on the rear-end of the commutator or directly to the armature coils. On a multiple wound armature the armature coils lying between two adjacent brush arms are influenced only by two main poles, when, on account of dissymetry in the magnetic system the air gap densities under these two poles are different from those under other poles; then a voltage will be generated between these two brush arms different from that on the other armature circuit causing the brush arms of the same polarity to receive different potentials which will make an additional current flow through brushes and brush-holder connections. These additional currents will overload the brushes and may cause sparking and heating of the commutator.

In multiple wound armatures the cross connections must be made between points of the winding that have the same potentials, the number of points usually agreeing to the number of pole pairs. The additional current mentioned will flow through the cross connections instead of through the brushes which obviously will improve the operation of the machine. However, the principal improvement through the use of cross connections is due to the fact that local alternating currents flow through the cross connections and the sections of the armature winding, which lead or lag with respect to the magnetic fields and which therefore exert magnetizing or demagnetizing effects on the fields. The currents always flow in such a direction as to strengthen the weaker poles and weaken the stronger ones, in consequence of this equalization of the pole strength, the voltage of the armature circuits are equalized also so that they can all deliver their share of the working current.

Small direct current machines with ratings up to about one or two horsepower are mostly bi-polar. These machines possess inherently small space for the armature winding and are usually wound, except in the cases of very low voltage, with a large number of turns of small wire. They also offer poor facilities for ventilation. In these smaller bi-polar machines the hand winding is the most commonly used, that of threading the wires from a spool or spools through the small openings. The sizes larger than above mentioned are mostly of the multi-polar type which offer the selection of one of several kinds of designs or types of coils such as Eik Meyer, Bastard, Diamond and others. Of all these the Diamond shape coil is probably the most popular for the reason that it is simpler and can be made easily and cheaply and fit together well, making a perfect symmetrical winding.

In the smaller sizes the coils are usually wire wound and, if of the diamond shape, wound in a loop, and after being taped are pulled out until they assume the desired shape.

In the larger sizes the coils are usually made of strap copper which are wound or formed on wooden or metal moulds or forms.

[1]Paper presented before Los Angeles Section, A. I. E. E., April 30, 1912.

With each general style of winding there are numerous variations necessary, due to unusual desired characteristics which may or may not effect the form of the coil and the method of winding. With many of these characteristics, the pitch or throw of the coil plays an important part. Fractional pitch windings are used extensively because of the reduced voltage generated in the short circuited coil which improves, to an extent, the commutation. Other favorable features are decreased armature reaction and a saving of non-active copper which results in decreased copper losses. This winding is not usually advisable in commutating pole machines as it requires a very much wider pole to produce a commutating field wide enough to act on the short circuited coil during the entire period of short circuiting.

In wire or strap wound coils after the conductors are removed from the forms they are wrapped with a layer or layers of suitably treated paper or cloth which is held in place with an over-lapping layer or two of linen or cotton tape. The entire coil is then dipped in insulating varnish and baked. Through the whole operation of putting the coils in the core great care should be taken not to fracture or damage in any way the coil or slot insulation. After inserting the coils, and sometimes during, the leads are connected in their proper places to the commutator and thoroughly soldered, preferably with hard solder, after which the commutator is turned, polished, balanced, tested and painted.

The field coils of direct current machines are subject to mechanical and magnetic stresses and for this reason must always be well and suitably insulated between turns and the frame of the machine. The voltage to be withstood consists not only of normal excitation voltage but very often of excessive voltage occasioned by the so-called kicks of the fields on opening the field circuit without a discharge resistance as is frequently done. This kick is sometimes guarded against, to an extent, by the employment of a short circuited copper band around the field coil. Then again at times the windings must withstand the most adverse conditions of dirt, moisture, and oil and the insulation must be selected with these conditions in view. In order to insure high efficiency and low cost careful consideration should be given to the ventilation of field coils. The ideal condition is to have bare wire exposed on all sides to the air and this method has been used on larger machines to some extent in the past and has been incorporated to as great a degree as possible in some small machines of recent design. In most of these cases, especially the smaller machines, enameled wire is used for the reason that a larger number of turns can be put in a given space and it is capable of standing up under higher temperatures and also affords better radiation of heat. After the field coils are properly impregnated which consists of placing them in a closed tank, in which the temperature is raised to a high degree, and the air exhausted thus removing the moisture and air from the coils, a moisture proof insulating compound, in liquid form and at a high temperature, is then run into the tank until the coils are immersed in the compound; air is then admitted to the tank under pressure, forcing the compound into all parts of the coils. The melting point of the compound is higher than any temperature the coils are likely to reach in operation so that under normal conditions they form solid and absolutely waterproof units. The compound is selected with a view to being a good conductor of heat and thus assists materially in maintaining a low operating temperature. A final coating of waterproof varnish a good wearing surface which is easy to keep clean. This impregnating treatment is sometimes applied to armature coils and nearly always to transformer coils.

Compound or interpole coils for direct current machines are practically always wound of few turns of copper strap or wire and in the large sizes are usually of the strap on edge type. The impregnating process is seldom necessary on these coils of large wire as they contain but little absorbent insulating material.

(To be continued)

MOTOR APPLICATION.

The following summary of factors entering into the application of motors to industrial purposes should be read in conjunction with W. S. Hoag's paper on this subject which appeared on page 554, June 1, 1912, issue of the Journal of Electricity, Power and Gas:

When a prime mover with its sundry appurtenances, hazardous investment, incalculable maintenance, depreciation and inflexibility, improper capacity and overestimated load factor, is proposed, merely on the basis of apparently lower cost of power from raw material; it is time for the salesman to demonstrate the advisability of paying more for the finished product, metered proportionately to the actual requirements.

Assuming that good electric power service is available, it should receive the first consideration, and the installation of a prime mover only as a last resort.

Motors of improper size are being used due to many causes, imposing unnecessary burden on consumers and producers of electric power. To remedy this, first, do not let it occur again; to change the existing cases is a harder task. However, co-operation of engineers and salesmen, combined with more scientific commercial conditions, will work wonders.

Troubles in motor driven installations are usually due to unsuitable protective devices, and mechanical defects in motor starters.

Cartridge fuses are expensive to renew and frequently renewals cannot be obtained in the local market within a reasonable time; consumer then resorts to makeshift methods.

Individual drive is not always practical, it sometimes means too large a motor investment and sometimes increases the connected load, making the fixed charges burdensome. Advantageous location of machinery, however, frequently justifies individual drive when consumer can make the investment.

Spontaneous combustion of coal is brought about by slow oxidation in an air supply sufficient to support oxidation but insufficient to carry away all the heat formed. The area of surface exposed to oxidation by a given mass of any one coal determines largely the amount of oxidation that takes place in the mass.

DRAFTING ROOM PRACTICE, IV.

BY A. L. MENZIN.

In this article are given examples of the kinds of work which the mechanical draftsman is most often called upon to execute.

Fig. 1 is a detailed drawing of a casting which is to be machined. In this class of work it is important to specify not only the dimensions of the respective parts but also whether these parts are to be cast or machined to size, unless the character of the work is such that no distinction is necessary. For designating that a part shall be cast to size, it is customary to prefer the dimension by "cast" or "core" depending on the nature of the foundry work. For designating

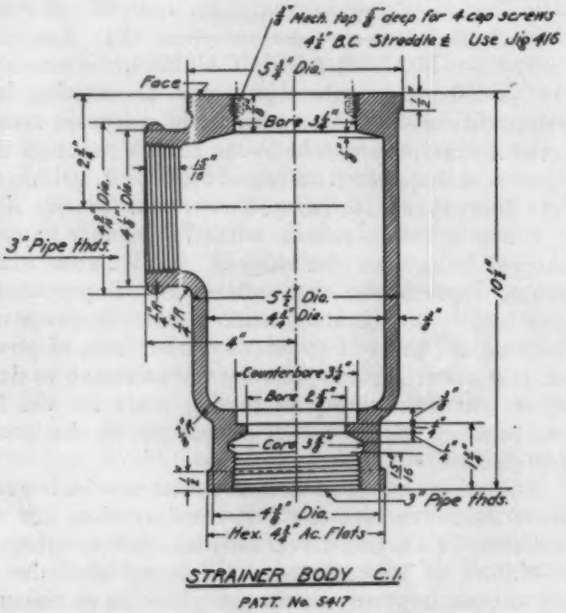

Fig. 1. A Drawing Illustrating a Machined Casting.

machined work the prefixes, "Turn," "Bore," "Counterbore," "Drill," "Ream," etc., are used. Another way of designating machined work is to place the letter f after the dimension or on the surface to be be machined. Thus, if a hole is to be bored to a diameter of 2⅝", the specification may be either "Bore 2⅝"" or "2⅝" Dia. f." Sometimes it is preferable to use one method and sometimes the other.

It is often necessary for proper construction to have a part machined to a jig, wire-gauge, etc., or to be fitted to the part with which it connects. Examples of specifications for such work are given in Figs. 1 and 2. In Fig. 1 the holes in the top are to be laid off from a jig designated by number. The size and depth of holes, the bolt circle, and the relative location of holes are given for reference. In Fig. 2 the size of the square on the left hand end is not given but the specification calls for a "snug fit in the hand wheel."

Fig. 1 also shows how a solid may be fully described in one view. If the shape of a part is such that it can be easily and accurately described by means of words, it is preferable to do so rather than to draw auxiliary views. Thus, the specification "5½" Dia." indicates that the shape is circular. The specification "Hex. 4¾" Ac. Flats" is all that the pattern-maker needs to construct the particular part referred to.

Fig 2 shows some additional specifications for machined work, particularly with regard to screw-threads. There are many different kinds of threads, and a complete specification of the particular threads desired should therefore be given. When the part is to have standard pipe or bolt threads, it is not necessary to give the number of threads per inch or to
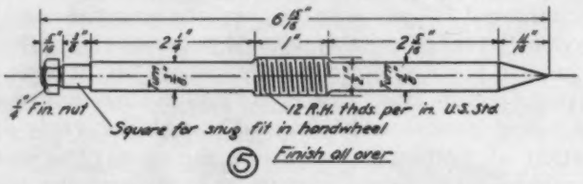
Fig. 2. Detailed Specification for Machined Work.

state whether the threads are to be right or left hand, U. S. Standard or otherwise. Such specifications as "½" Pipe threads" or "2½" Mach. threads" are sufficient. If a hole is to be threaded with a standard tap, the specification commonly used is "½" Pipe tap" or "½" Mach. tap," as the case may be.

In Fig. 2 is also shown a commonly employed method of designating a part by number instead of by name. Part numbers are usually enclosed in circles about ⅜ of an in. in diameter to give them prominence. For specific reference on bills of materials, orders, and for pattern numbers, these part numbers are very convenient. If a part has the number 5 on a drawing numbered D576, the reference is usually written as D 576—5.

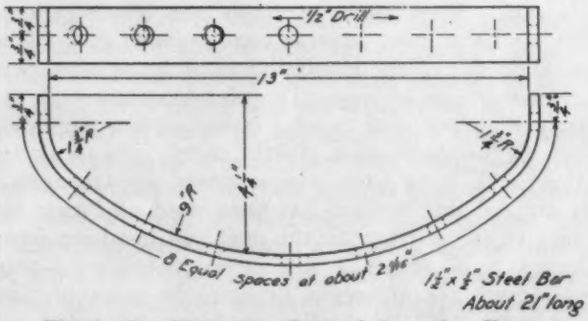

Fig. 3. Detailing of a Part of Irregular Shape.

Fig. 3 is intended to show some specifications in the detailing of a part of irregular shape.

When holes are to be laid off on a curved surface at equal distances apart it is usually preferable to give the information in a way which will enable the workman to locate the respective holes with a pair of dividers, instead of specifying the center to center distance, which is very difficult for the draftsman to determine. In Fig. 3 is shown the conventional way of giving this information. The object of giving the

approximate length of each space is to enable the workman to make a close setting of the dividers for the first trial.

When holes are all of the same size and are numerous or difficult to draw, it is often sufficient to show only the center lines of the holes, as in the upper right-hand corner of Fig. 3.

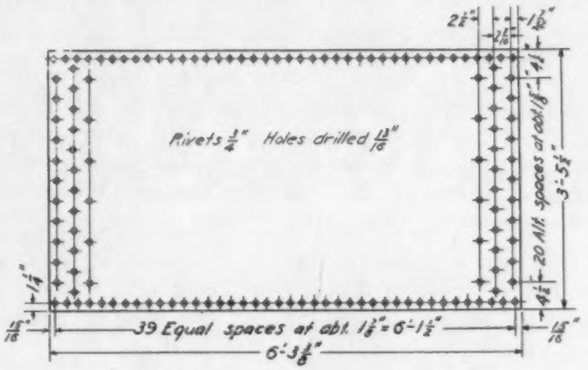

Fig. 4. Layout for a Triple Riveted Seam.

It is very desirable when a part is to be made out of stock material to have the amount of stock required given on the drawing, as in Fig. 3. This information is of great help in ordering the necessary stock promptly.

Fig. 4 shows a layout of rivet holes for a triple riveted, double butt-strapped longitudinal seam, and a single riveted circumferential seam.

BRITISH ENGINEERING ACTIVITY IN CHINA.

The current Electrical Review of London comments editorially on the recently formed British Engineers' Association. In view of longing eyes now being cast toward engineering openings In the awakened China by many Western men, the following excerpt is interesting:

An important association has just been formed, known as the British Engineers' Association, with the object of establishing itself as a great national organization for the promotion of the overseas interests of the British engineering industry as a whole—not to serve the interests of any one firm or clique, or to carry on trade in any way, but to overcome the obstacles by which our trade is hampered. The association was formed by twenty-two well-known British engineering firms, and even before incorporation (which took place on April 26th) it included some sixty members, most of them being firms of the highest standing, while others were awaiting election.

The efforts of the association will be directed for the present exclusively to China, where the organization and strengthening of British engineering interests is urgently needed; the constitution is drawn up on broad lines by no means restricting the action of the association to foreign trade alone, and includes the promotion or opposition of legislation, the circulation of information and statistics, support to the British Government and other influential organizations, and keeping a watch upon the methods and progress of foreign competitors. Other objects are to encourage the predominance of British technical instructors in Asiatic and other schools, to facilitate the training of Oriental engineers in British colleges and works, and to promote the use of the English language as the recognized medium of engineering business.

The importance of China as a market for British engineering products is so self-evident as to need no emphasis, and under the new regime, when things have settled down, there is every prospect that an enormous development will rapidly take place; China, in fact, will probably become one of the greatest markets for engineering plant, but whereas in the case of Japan our early influence was deeply established, and its effects are still active, in China we find ourselves at the outset in competition with our modern rivals, whose Governments, moreover, effectively assist their agents in diverting trade to their own people. In the absence of any similar support our manufacturers are well advised to join hands with a view to counteracting the strenuous campaign which is being conducted by Germany and the United States in the Far East. That immense benefits can be secured to British interests by energetic and judicious action is certain, and we gladly extend a hearty welcome to this very excellent association.

ACTION OF CALIFORNIA RAILROAD COMMISSION.

The application of the Stockton Terminal & Eastern Railroad Company for permission to issue $65,000 in bonds has been granted by the State Railroad Commission. The Stockton Terminal & Eastern is incorporated to run from the city of Stockton to the town of Jenny Lind in Calaveras County, a distance of approximately thirty miles. The line has been constructed and is in operation from Stockton as far as Fine, a distance of fifteen miles. Trains have been run since September, 1910. A steam service has been succeeded by gasoline motor cars. It is the intention of the Company ultimately to operate by electricity.

The proceeds to be derived from the sale of $65,000 in bonds are to be devoted to the discharge of obligations to the amount of $26,925.82 and for extensions and improvements.

Referring to its authority to pass upon proposed issues of stocks and bonds, the Commission says:

"It will, of course, be borne in mind by the investing public that this Commission does not guarantee bonds, stocks or other securities which it authorizes. Ordinarily the Commission's function in passing upon a proposed bond issue is personally to ascertain whether the purpose for which it is desired to secure funds is proper and whether the monies desired for such purposes are reasonably necessary therefor and whether the bonds are sold for a reasonably high price and to take the necessary steps to assure itself that the monies derived from the disposition of such securities are expended solely for the purposes authorized."

RAILWAY SIGNALING.[1]

BY J. S. HOBSON.

Shortly after the first steam railroads were operated in England, or about 1830, the need for conveying information to trains by means of signals became apparent and resulted in the use of a number of different designs. Each railroad followed its own ideas and having adopted certain forms of signals, arbitrarily assigned certain meanings to them irrespective of all other roads. As the original railroads were extended and connected with each other, interchange of traffic resulted. Consequently, the employes of one line whose duties required them to operate trains over foreign roads using entirely different signals frequently misread their meaning and accidents followed.

No radical attempt appears to have been made to standardize signaling, however, until after the adoption of the semaphore by Mr. C. H. Gregory in 1840. The semaphore, which, as everybody knows, consists of a mast with one or more movable arms, is one of the oldest known devices for conveying meanings by signs. Tradition says it was invented by a Greek named Polybius about two thousand years ago, who possibly conceived the idea from seeing a man make signs by holding his arms at different angles to his body.

The semaphore was used by the Romans and afterwards by practically all civilized nations for conveying information comparatively great distances before the invention of the electric telegraph and since its first adaptation to railroad uses in 1840, it has been developed and improved till it is now the standard signal on practically all railroads.

The semaphore has, however, one shortcoming, namely, that it cannot be seen in the dark, and although many attempts have been made to devise an illuminated arm, so far entirely successful results have yet to be attained. Consequently, all night indications and signals in tunnels and subways have to be displayed by lights of different colors.

About 1843 attempts were made to operate several signals and switches from some central point by means of a group of levers connected to them by wires and pipes. In the first plants so erected there were no locking devices to prevent the improper operation of the switches and signals, and man being fallible then as now, switches were occasionally thrown under trains, and signals for conflicting routes cleared simultaneously with the usual unhappy results. To overcome the first defect a device called the detector bar was invented, which consists of a movable bar longer than the greatest distance between adjacent wheels and attached to the rail by a series of radial arms or motion plates. The preliminary movement of the switch or lock lever to which this bar is connected tends to raise it above rail level and should a train occupy the track the detector bar will strike against the tread or flanges of the wheels and prevent further movement of the switch or lock. This device is still used on interlocking plants except where track circuit locking is employed, in which event the switch lever is guarded against wrongful manipulation by the presence of a train on a track circuit at the switch, controlling an electric lock on the operating lever.

The other defect in the first plants installed, namely the possibility of clearing conflicting signals, or clearing signals governing movements over switches improperly set, was overcome in 1856 by Mr. Saxby, who devised means for so interlocking the various levers in a plant, that they could be operated only in certain predetermined orders. Consequently the first real interlocking plant may be said to have been erected in that year, and though the plants of today vary in many details and are of course greatly superior, yet they all embody the broad basic principles contained in the first plant installed in 1856. These are:

First: That before a signal governing train movements over a certain route can be cleared, all switches in that route or in others conflicting with it must be properly set and locked, and all opposing or conflicting signals displayed in the stop position.

Second: That when the first named signal has been cleared no switches in the route it governs, or routes conflicting with it, can be unlocked or moved, nor any opposing or conflicting signals cleared, and

Third: No switch can be unlocked nor moved when a train is standing on or passing over it.

Interlocking plants were not introduced into the United States until 1874, or eighteen years after Mr. Saxby's first plant was built in England. This was doubtless due to two causes, viz: less congested traffic and smaller available capital per mile of railroad. In that year the Pennsylvania Railroad contracted with the Saxby and Farmer Company of England for the installation of an interlocking plant at East Newark, New Jersey, all of the material as well as the mechanics who installed it being imported from England.

This plant was shortly followed by others, both on the Pennsylvania and New York Central lines, and a few years later the American rights to the Saxby and Farmer patents were acquired by the Union Switch & Signal Company, incorporated in 1882. American ingenuity having become conversant with the interlocking system immediately proceeded to improve it and in 1876 a practical power interlocking was installed, experimentally, at Mantua near Philadelphia, under the patents of Prall and Burr. Soon afterwards Mr. George Westinghouse began to adapt some of the ideas embodied in his air brake to the operation of railway switches and also experimented with an hydraulic interlocking system.

A plant of this nature was erected at Wellington, Ohio, in 1882, and in 1883 and 1884 the first hydro-pneumatic machine was installed at Bound Brook, New Jersey, on the Central Railroad of New Jersey. The Bound Brook plant may be considered as the first really successful power interlocking and the forerunner of the present electro-pneumatic system now operating the majority of the great railway terminals in the United States, as well as hundreds of other plants both here and in foreign countries.

In the modern electro-pneumatic plant all switches and signals are operated by compressed air at from 75 to 100 lb. pressure, through the medium of cylin-

[1]Paper read before San Francisco Section, A. I. E. E., May 24, 1912.

ders and pistons connected directly to the switch or signal mechanism. The admission and release of the air to and from the cylinders is effected by ironclad electro-magnets of extremely rugged design which are in turn energized and de-energized through circuit controllers attached to the levers of the interlocking machine. These levers are interlocked by mechanical means similar to those employed in all other interlocking machines.

In 1888 Mr. John D. Taylor began experimenting with a purely electric system, which he first exhibited in the old Exposition Building, Chicago, the following year. After some further experiments he installed a practical electric interlocking plant at East Norwood, Ohio, on the B. &. O. S. W. and C. L. & W. in 1890-91, which was the first really successful plant of this type, although Messrs. Ramsey and Weir had erected an electric interlocking at College Hill, Ohio, on the C. H. & D. the year before.

There are several electric interlocking systems in general use today, in all of which the switches and high signals are operated by electric motors through gearing, and the dwarf signals by solenoids or motors.

As a general proposition mechanical interlocking plants with or without electrical accessories are the simplest and cheapest plants to install and operate where local conditions are favorable to their use.

Power actuated interlockings are employed first —where traffic conditions, such as a busy terminal, require very rapid operation of switches and signals; second—where switches and signals are at such distances from the tower as to render their operation by mechanical connections impracticable; third—where the plant is of such a size as to make its operation by power more economical than by mechanical means, both in the number of levermen required and the space occupied by the machine and its connections, and fourth—where obstacles, such as paved streets, narrow roadbeds, etc., make the location of mechanical connections difficult and expensive.

Block Signaling.

Block signaling, or the maintenance of a space interval between trains, is the second great branch of railway signaling and dates from 1839 when, at the suggestion of Messrs. Cooke and Wheatstone, the Great Western Railway of England began telegraphing the arrival and departure of its trains from station to station on a section of its line near London.

In 1842 Mr. W. F. Cooke laid down the following principles for a block system, which have been closely followed in all systems since devised:

> Every point of a line is a dangerous point, which ought to be covered by signals. The whole distance consequently, ought to be divided into sections, and at the end as well as the beginning of them, there ought to be a signal, by means of which the entrance to the section is opened to each train when we are sure that it is free. As these sections are too long to be worked by a traction rod they ought to be worked by electricity. At the end of each section of from two to two and a half miles, a line-keeper is stationed in a hut, with a turning disk, or a semaphore. In each hut there ought to be two telegraphs with magnetic needles, the one on the right hand being in communication with that on the left of the neighboring hut. The needle telegraph can only give two signals: "line clear" or "line blocked."

The block system in England was improved from time to time by the introduction of electric locking and other checks between operators at adjoining stations, and the English are also responsible for the invention of the electric train staff and tablet systems for single track operation. In these last mentioned systems no train is permitted to enter a block section without first obtaining a tangible right to do so, in the form of a staff or tablet which is in effect a metal train order.

The Southern Pacific main line over the Sierras from Colfax to Truckee is operated under the electric train staff system.

It remained, however, for the inventive American to devise and develop the highest type of block signaling, namely the "automatic system" in which the block signals are directly controlled by the presence or absence of trains in their respective block sections.

Thomas S. Hall of Hartford, Conn., was, as far as can be determined, the first man to install automatic block signals, having placed some in operation on the N. Y. N. H. & H. in 1866 or 67. These were of the disc type and operated by track instruments which were struck by the wheels of passing trains.

The "track circuit" was invented by William Robinson and Franklin L. Pope, the latter of whom installed the first one on the Boston & Lowell R. R. in 1871. At the Centennial Exhibition in 1876 Mr. Pope exhibited a track circuit working under water, as a practical demonstration of its ability to operate under unfavorable ballast conditions.

For over twenty years opinion was divided between engineers as to the comparative merits of track instruments and track circuits for the operation of automatic signals on steam railroads. While it was generally admitted that the continuous track circuit was theoretically the ideal method, yet owing to the practical difficulties encountered in the early stages of the art, many engineers felt that track instrument control was the more reliable of the two.

With improvements in track ballast, drainage and methods of installation, and particularly because of larger and more efficient track relays, the track circuit method gradually out-distanced its competitor and since about 1895 has been the only recognized method of automatic control on steam railroads.

It is interesting to note that to a certain extent history is now repeating itself on electric railroads, where numerous devices in the shape of track and trolley instruments are being offered as substitutes for continuous track circuit.

As a general proposition, however, the management of most electric railroads using automatic block signals fully realize the advantages of the alternating current track circuit and it is being rapidly introduced and extended on such lines.

The a.c. track circuit was invented by J. B. Struble in 1901 and the first installation was made on the North Shore Railroad between Sausalito and San Anselmo in 1903.

In the early days of automatic signaling two types of signals were employed, the enclosed disc and the rotating banner.

The first consisted of a banjo shaped head within which a red disc and light were displayed to indicate "stop" and a green or white disc and light to indicate "clear." The disc and colored glasses were mounted on a pivot and operated directly by electro magnets, the current being supplied by gravity batteries. This signal, as is obvious, displayed both its night and day indications by changes of color entirely.

The rotating banner signal had a banner of special form and a four lens lamp mounted on a vertical shaft in the same manner as a switch target which shaft was rotated 90 degrees at each movement by clockwork, the power being furnished by a weight within the signal post which was wound up about once a week.

The control was by means of electro magnets and gravity batteries and the signal is noteworthy as requiring less electrical energy for its operation than any before or since designed. At a test made in Boston the signal was operated a number of times by one cell of gravity battery, the elements of which were contained in a five-cent ink bottle.

The first semaphore to be used for automatic signaling was of the electro-pneumatic type installed on the Fitchburgh Railroad in 1883.

In the three automatic signals just mentioned the mechanisms were all placed as closely to the signal arm they operated as possible, and hence were what is now technically known as "top mast" signals. Such a signal requires that the maintainer climb the ladder to inspect or repair a mechanism, and to overcome this objection the electro pneumatic signal was redesigned in 1893, and its mechanism placed at the base on the post, the connections between the mechanisms and blades being run inside the post itself. This is now shown as a bottom post signal.

Semaphores operated solely by electric means had been used by Taylor, Ramsey, Weir and Lattig in their electric interlockings, but none had been applied to automatic purposes to any extent, if at all, until J. P. Coleman brought out his first electric semaphore in 1897.

In designing this signal to compete as closely as possible in first cost and in cost of operation with the disc and banner types then most commonly used, without sacrificing safety, Mr. Coleman enclosed all the moving parts except the spectacle and blade, provided roller bearings wherever practicable, and generally reduced the power required for its operation to a minimum. He placed the mechanism in a case at the base of the signal at a convenient height from the ground for inspection and adjustment.

Many of the ideas contained in this design have been embodied in the present types of electric semaphores, of which there are upwards of 75,000 in service today.

Within the last five years the original top-mast idea has been applied to several designs of electric semaphores, and today there are a number in successful operation.

Since its first introduction to this country, the "clear" and "caution" indications of practically all semaphore signals were displayed by depressing the arm below the horizontal and providing an artificial counterweight for restoring it to the horizontal or "stop" position by gravity. In recent years, however, it has become the general practice on a number of railroads to incline the blade upwardly for the "caution" and "clear" indications, which has been the practice in Germany for many years. The main advantage of this is that the blade becomes its own counterweight and any accumulation of sleet and snow will assist in restoring it to the "stop" position instead of retarding its return, as in the "lower quadrant" type.

The practice of using signals displaying three distinct indications with one arm and light has grown considerably in favor of late years.

ELECTRIC FIRING OF SHOTS.

As a result of efforts to make the firing of shots in coal mines safer, systems of firing by electricity have been developed. These systems, in the best practice, require that all men shall be out of the mine before any shots are fired. The essential features of a good electrical firing system, according to information just compiled by the Bureau of Mines, are as follows:

The mine is wired with rubber-covered wires laid in parallel in order that one defective shot may not prevent others from being fired. On the main entries No. 6 rubber-covered wire is used, on the cross entries No. 10 or No. 12, and in the rooms No. 14 wire. These wires are hung from props or from plugs set in the roof. At the mouth of each cross entry there is placed a locked box in which there is a single-pole double-throw switch that is arranged to open downward to avoid accidental contact by falling. A similar, though smaller, switch is in some mines placed at the mouth of each room, or else the room wire is connected to the wire on the cross entry without the use of a switch. At the mouth of the mine there is a shot-firing cabin in which a 100-ampere, two-pole, single-throw switch is placed. There is a similar switch of the same size in the power house. This plan insures that there shall always be at least three open switches between the mine and the power house when the shot is being connected up. Fig. 1 illustrates the arrangement of shot-firing wires in a mine room.

The operation of the system is as follows: Every employe in the mine is given a brass check with his number stamped upon it. Upon entering the mine he hangs his check upon a check board in the shot-firing cabin. This board has painted upon it numbers which correspond to the numbers on the checks, and each check is hung over the proper number. No one is allowed to enter the mine unless he has previously hung up his check on the check board.

Usually the miners are allwed a certain maximum number of shots for each working place—generally three. The coal is undercut in most places, and permissible explosives are used. Special shot firers go through the mine during the day examining the shots as they are being prepared by the miner and distributing the electric detonators. In some instances the miner tamps the shots himself; in others the shots are tamped by the special shot firers. If the miner tamps the shots, he connects the detonator legs sticking out of the shot hole to the No. 14 wire, which extends up

the roadway of the room, notes that the connection at the room mouth is made, and then leaves the mine. In connecting the detonator legs to the No. 14 wire care is taken to strip the insulation off the lead wires and to wrap the legs around the No. 14 wire, not looping them, as is done in some mines.

After all the miners have left the mine the shot firer goes through each entry and notes that the switch at the mouth of each room is closed or that the connection is made at the room mouth if the switch is not used. At the mouth of each cross entry he unlocks the

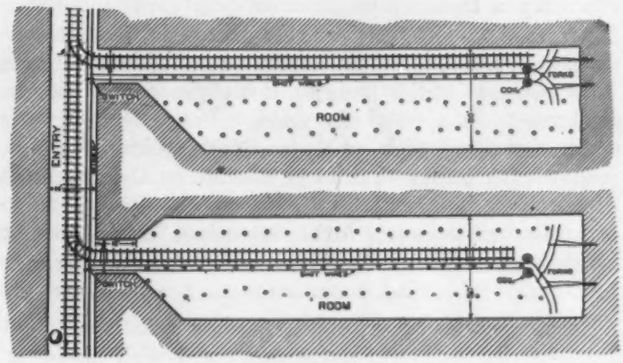

Fig. 1. Proper Arrangement of Shot-Firing Wires in Mine Room.

switch box, throws in the switch, and locks the box. He then proceeds to the mouth of the mine, enters the shot-firing cabin, and notes that all the checks have been taken off the board, which signifies that the check owners have left the mine. If any checks are still remaining on the board, he searches the mine until the men represented by the checks are found, or if any miner has left the mine without taking his check with him this fact is determined. Usually there is a fine provided for failure to leave or take away a check at the proper time.

When the shot firer has ascertained that all the checks have been taken from the board, he then goes to the power house, where there is a switch provided, and generally an electric generator giving direct current of about 500 volts, to fire the shots. The shot firer instructs the man in the power house to throw in the power house switch and then returns to his own cabin, unlocks the switch box there, and throws in the switch, thus firing all the shots in the mine. After the shots have been fired, the shot firer opens the switch and locks the box.

There are always some misfires, caused by carelessness in making connections, by falls of roof deranging the wires, or by projecting portions of the roof cutting the insulation off the wires. The fire boss goes into the mine about an hour after the shots have been fired and unlocks each box, throws out the switch, and locks the box again. He then proceeds to each working place, notes what shots failed to go off, and connects them up properly. When he leaves the mine at the close of his shift he unlocks each box, throws in the switches, and fires the shots just as a shot firer on a day shift would do. By this procedure the number of failures is reduced to a minimum. The average proportion of failures is said to be about one-half of 1 per cent, or about one failure to every 200 shots.

Fig. 2 shows a plan of mine workings wired for such a method of electrical firing.

The cost of equipping a mine for firing shots by the method above outlined varies from $1000 to $3000, depending upon the size of the mine. The maintenance and operation of the system is said to cost from 1 to 3 cents per ton. It has been used successfully for some time past in some coal fields, and its adoption in other fields, when permitted by local conditions, would reduce accidents in coal mines.

THE ELECTRICAL INDUSTRY AND TRADE IN GREAT BRITAIN.

Last year the electrical industry experienced a large measure of prosperity in the United Kingdom, so far as the output was concerned, but it is claimed that price cutting was so general and severe that the returns from dynamos and motors fell to a point where they could not be sold at a profit. As a result of the recent coal strike, attention has been widely directed to the use of electricity for motive power, lighting, cooking, etc. The manager of one of the electric companies in London stated recently that his company had orders for nine months ahead for motors, which would tax the full capacity of its works. The electrification of railways was carried on to a greater extent in 1911 than in the preceding year, especially in London and the north of England.

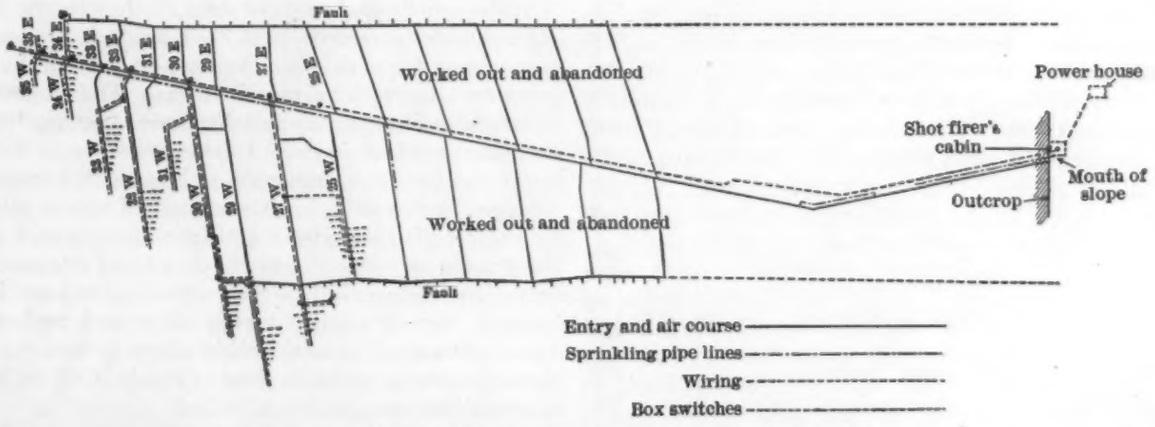

Fig. 2. Plan of Mine Workings Wired for Electrical Firing.

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FOUNDED 1887 AS THE
PACIFIC LUMBERMAN, CONTRACTOR AND ELECTRICIAN

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San Francisco In 1915

The Golden Poppy Special leaves tonight for the great convention of the National Electric Light Association. Throughout the week eastern visitors have been experiencing the exhilarating effects of western enterprise and hospitality. The move for the next two days will be concentrated upon Seattle. Never before has the West shown such united force in boosting an electrical convention.

Strength be to her strong right arm during the next week! May she consumate with characteristic efficiency a task labored for so long!

The West feels justified in asking the Seattle convention for a second visit from her eastern brothers. This time a world triumph in engineering will be celebrated. In a word, the Golden Poppy Special goes north, bedecked with its thousands of golden poppies, prepared to pop a definite question to the National Electric Light Association in convention assembled—and no other answer will be taken but "we'll come to San Francisco in 1915."

Convention Papers

Since the days of long ago, when Archimedes announced that he could move the world with his lever, engineers have recognized that the strength of a lever or beam varied with the breadth of cross-section in the material employed. They have known that its depth in cross-section was also a factor in the strength attained and that this strength increased in a greater proportion than similar increase in breadth. Indeed, careful modern mathematical investigation has shown conclusively that while a beam increases in strength directly with breadth, by doubling the depth, its strength is increased fourfold.

Thorough discussion is the modern lever that moves a world of engineering thought. The papers to be presented at the Seattle convention discuss subjects of the most interesting and vital nature to the electric lighting industry. These papers, presented by the greatest living authorities in each particular subject, represent the last word of advance yet accomplished. Within the hearing of the readers will be men of national experience, pre-eminently qualified to discuss with force and vigor. Breadth of view should indeed be seen on all sides, but above all depth should not be forgotten.

The enormous strides taken in the electric lighting industry in recent years have made it beyond human power for a single individual to master the subject in all its various ramifications. The importance of carefully filed papers and discussions on vital topics is made manifest from the experiences each day encountered by those engaged in the art. No longer do we consider the publishing broadcast of results attained by years of faithful study and investigaion as a possible placing of weapons in the hands of our competitors. The old world has grown too big and too broad for such narrow-minded views. The dark and murky den of the alchemist of the middle ages presents a vivid picture of the stagnation sure to result from such narrow-minded practice.

In the grinding out of our national supply of electric power for lighting there is used every mechanism

known to human invention. The brains of our great commercial engineers play no insignificant part in the onward trend of affairs electrical. It takes little stretch of imagination to picture the inner workings of our modern intellectual talent as being analogous to a complete and highly efficient modern power plant wherein smoothly running cams, gears, ratchets and levers convert fleeting mental inspirations into full-blown practical ideas for the advance of the industry. Careful and earnest discussion may be likened to levers which put ideas into harmonious action.

It is to be hoped that all qualified to speak will not hesitate to do so and that the discussion may proceed with vim and vigor. Thus, with discussion duly proportioned in breadth and depth by men of pre-eminent attainments in the questions at issue, this modern lever should in truth move a world of engineering thought. When thus properly constructed let us then rest this lever upon its fulcrum—the National Electric Light Association—and the lighting industry will move ahead as it is wont to do by leaps and bounds.

British Engineering Activities in China

Some weeks ago editorial comment was made in these columns relative to the engineering opportunities immediately ahead in China for Western engineers. Indeed, the reawakening of China and its gigantic possibilities form no mean asset to the great cities on the western slope of America. That the energies of our engineering brothers in the British Isles are to be at once concentrated upon China in an effort to cut off from us our natural birthright is clearly shown in an excerpt appearing on another page under the heading of British Engineering Activity in China.

Engineers of the Pacific Coast States and Western Canada have been so engrossed in building an empire within, time to look out over the seas to add to our engineering accomplishments has indeed been scant. It is but natural to believe that, due to their favored location, western sea port cities, equipped with every modern convenience, are in a position to command a respectful hearing in competitive commercial activity soon to be brought about in the completion of the Panama Canal.

In this readjustment of the world's commerce new empires and new industrial centers will be formed. The favored situation of the western slope of America, constituting in a measure a center of gravity between the old and the new, should make this locality the stage upon which many of the engineering feats of these new empires are to be acted.

Such a realization have more than one precedent, as can be easily verified by reference to history. In the thirteenth and fourteenth centuries, the reawakening of Western Europe and reopened activities with Western Asia made the central cities—Venice, Naples, Florence and others—world powers in transporting this world activity from the east to the west and from the west to the east. Indeed, returning to the situation in the new west, long since, Seward has said the Pacific Ocean, its shores, its islands and the vast regions beyond, will become the chief theater of events in the world's great hereafter.

Immediately to our west, situated on the same waters that lap our shores, one-third of the population of the globe is located. The Puget Sound, the Columbia River, the San Francisco Bay, San Pedro and San Diego harbors will soon have a great work in bearing burdens to this vast empire across the seas. No insignificant part of this burden should be that of transporting our just share of brains and talent to aid in this great work. It behooves our engineering firms, then—both designing and industrial—to get busy in planning a competitive campaign to meet that already inaugurated by our British cousins in China.

The Engineer and Constructive Citizenship

In our issue of Dec. 2, 1911, there was published an article by the late Richard T. Crane on The Futility of Technical Schools. We took occasion at that time to comment editorially on the many unjust and harsh criticisms made by Mr. Crane.

Elsewhere in these columns will be found the graduating address on the Relation of the Engineer to Constructive Citizenship, by Lester S. Ready, who recently received his degree from the college of mechanical engineering at the University of California and who was awarded the class medal as being the most distinguished student of a class of 679 receiving their diplomas. The ideas of this young man are interesting to engineers and embody, in a measure, a complete answer to the shallow arguments put forth by Mr. Crane. Indeed all of the criticism put forth by the late founder of Crane & Co. smelled so of the dollar and cent valuation that many were prone to cast aside the criticism without going further, but now in these views of the young technical graduate so ably expressed, the keen observer notes at a glance that citizenship—the prime reason for the state's investing enormous sums in the technical training of the young—is being immeasurably heightened.

The technical institutions of the West will for the next month continue to pour forth their engineering graduates into the broiling sea of commercial life. The able leaders of engineering in this vast western domain are fast beginning to acknowledge the prowess of high ideals here imbued, and the peculiar fitness of her sons to grapple with western problems. The first of these institutions to hold its commencement thus far this year was the University of California. Although a record-breaking class has just graduated from the mechanical and electrical engineering department, over ninety per cent of these young men have already found technical positions in spite of the fact that only ten days have elapsed since their graduation. Undoubtedly by the great engineering corporations the same hungry search for capable energetic men will be made among the Stanford graduates, those of Washington, Oregon and other western institutions.

The Journal offers the heartiest congratulations to these young engineers and trusts that they will never swerve from their high public trust—that of raising to the highest standard of excellence possible, the relation of the engineer to constructive citizenship.

PERSONALS.

C. R. Dederick, an electrical supply dealer of Portland, was at San Francisco this week.

Rudolph W. Van Norden, consulting engineer at San Francisco, has returned from Fresno.

H. R. Noack, president of Pierson, Roeding & Company, has returned to San Francisco from Los Angeles.

Robert Sibley, editor of the Journal of Electricity, Power and Gas, has returned to San Francisco from Santa Cruz.

Thomas Mirk of the firm of Hunt, Mirk & Co. spent the past week at Los Angeles and San Diego on engineering business.

C. O. Poole, of the firm of Manifold & Poole, electrical engineers of Los Angeles, spent a few days at San Francisco during the past week.

F. F. Skeel, manager of the Crouse-Hinds Company, returned to San Francisco during the past week, after visiting Los Angeles on business.

H. A. Hughes, formerly with the Pittsburg office, has joined the sales corps of the Westinghouse Electric & Manufacturing Company's San Francisco office.

Frank H. Gale, in charge of advertising for the General Electric Company, was at San Francisco this week from Schenectady, leaving for Seattle on Friday night.

Frank Connell, head of the Skinner Engine Company, of Erie, Pa., spent the past week at San Francisco, where he came to meet his family on their return from the Orient.

J. G. Blake, general superintendent of the Postal Telegraph Cable Company, with headquarters at San Francisco, is at New York with the intention of spending six weeks in the East.

E. W. Bannister, formerly assistant engineer on the Los Angeles Aqueduct, has been appointed sales engineer for the Aqueduct Advisory Board, selling surplus equipment and materials.

C. W. Waller, a successful promoter of electric power enterprises, has returned from a European trip and is again making his headquarters in the Alaska Commercial Building, San Francisco.

Alvah K. Lowrie, one of the directors of the Aluminum Company of America, recently visited the San Francisco office of Pierson, Roeding & Co., while en route from the Orient to his home in the East.

G. M. Robertson, engineer of the Board of Fire Underwriters of the Pacific, has returned to San Francisco after a trip to Chicago, where he was elected vice-president of the National Fire Protective Association.

O. M. Rau, general manager of the Commonwealth Power Company of Milwaukee, Wis., is at Los Angeles, with Mrs. Rau and will go to Seattle during the coming week to attend the annual convention of the N. E. L. A.

Leslie F. Curtiss, formerly with the General Electric Company at Schenectady, N. Y., and a graduate of Tuft's College, in the class of 1910, has been appointed instructor in electrical engineering at the University of Washington, Seattle.

Clarence Cory Harshman, nephew of C. L. Cory of San Francisco, shipped aboard the Manchuria on last Thursday as a fireman. The young apprentice will return from China in time to assume his studies at the University of California in the fall.

M. F. Steele, of the sales force of F. H. Poss, Pacific Coast agent for the Benjamin Electric Company, spent the past week at Seattle, installing an exhibit of Benjamin electrical materials at the National Electric Light Association convention hall.

Chas. R. Rail, secretary and treasurer of the Pittsburg Piping & Equipment Company, has returned to Pittsburg after spending two weeks in California with Theo F. Dredge, Pacific Coast representative for the company.

Arnold Pfau, hydraulic engineer with the Allis-Chalmers Company, has returned from Milwaukee and will spend a week or two at the San Francisco office of the company on business connected with hydroelectric contracts to be let in California.

Harold W. Cope, assistant manager of the industrial and power department of the Westinghouse Electric & Manufacturing Company, of East Pittsburg visited the district offices at Los Angeles during the past week on his way to the N. E. L. A. convention at Seattle.

T. E. Bibbins, local manager of the General Electric Company's San Francisco office, and **E. O. Shreve,** sales manager with the company, accompanied the Red Special to the N. E. L. A. convention as far as Los Angeles, whence they came directly to San Francisco.

S. P. Russell, manager of the electrical supply department of the H. W. Johns-Manville Company's San Francisco house, is spending two weeks at the Presidio on duty at the militia encampment. He is first lieutenant of the Sixth Company of the Coast Artillery, N. G. C.

Joseph B. Kahn, superintendent of the municipal electricity department of Alameda, is preparing plans for a new fireproof power-house building for the steam plant, which is to be doubled in capacity by the installation of additional engines and generators at an estimated cost of $110,000.

William Nixon, chief of the department of electricity of San Francisco, addressed the Downtown Committee of the Chamber of Commerce at their weekly luncheon last Wednesday. He explained the operation of the city's fire alarm telegraph system and described the electrical inspection methods of his department.

W. C. Baker, of Salt Lake City, formerly assistant to the superintendent of the electrical railway system of that city, has been appointed superintendent of the Yakima division of the Oregon-Washington Railroad & Navigation Company, and of the Yakima Valley Transportation Company and electric lines owned by the Harriman interests.

Hans von Schulthess, consulting engineer of Zurich, Switzerland, is investigating and reporting upon Pacific Coast hydroelectric plants in the course of an American trip in the interest of Swiss financiers. He has already visited several of the properties in Southern and Central California, and expects to proceed to Seattle on the Golden Poppy Special.

J. H. Pardee, vice-president and manager of the operating department of J. G. White & Company of New York, arrived from the East and spent several days at San Francisco before departing for Seattle to attend the National Electric Light Association's annual convention. He was accompanied by C. F. Conn, assistant manager of the firm's San Francisco office, when he went north.

C. W. Larner, representing the Wellman, Seaver, Morgan Company, of Cleveland, is among the representatives of eastern water wheel manufacturers who are at San Francisco conferring with the management of the Great Western Power Company regarding the details for their proposed 35,000 h.p. water wheel for the additional generating unit that is to be installed in the extension of the power station at Big Bend.

The delegates to the Seattle convention of the National Electric Light Association who spent the past week in California en route from Boston and New York City on the Red Special were as follows: J. R. Crouse and wife, National Quality Lamp Division of General Electric Company; H. A. Tremaine and wife, National Quality Lamp Division of General Electric Company; Ray D. Lillibridge, Wagner Electric Manufacturing Company; F. M. Tait and wife, The Dayton Power & Light Company; Charles Wuichet and wife, The Dayton Power & Light Company; A. E. Carrier and wife, National Carbon Company; H. B. Logan and wife, Dossert & Company; R. W. Charles and wife, Otis Elevator Company; T. E. Murray and wife, N. Y. Edison Company; John W. Lieb, Jr., and wife, N. Y. Edison Company; John R. Graham and wife, Bangor Railway & Electric Company; Miss Julia Engler, Miss Graham; Arthur Williams, N. Y. Edison Company; S. C. D. Johns and wife, Cleveland Electric Illuminating Company; E. J. Bechtel and wife, Hodenpyl, Hardy Company; T. Beran and wife, General Electric Company; George W. Elliott and wife, Electrical World; Chas. H. Hodskinson and wife, Edison Electric Illuminating Company; G. T. Hanson, Okonite Company; Leslie C. Love; J. W. Howell and wife, General Electric Company; D. C. Shain and wife, Scranton Electric Company; George W. Higgins and wife, New York Central Lines; J. B. Seaman, The Philadelphia Electric Company; B. Frank Day, The Philadelphia Electric Company; R. S. Hale, Edison Electric Illuminating Company; S. G. Rhodes and wife, New York Edison Company; S. E. Doane, National Quality Lamp Division of General Electric Company; E. W. Lloyd and wife, Commonwealth Edison Company; Arthur B. Huey and wife, The Philadelphia Electric Company; J. B. McCall and wife, The Philadelphia Electric Company; C. L. Bundy and wife, Philadelphia Electrical & Manufacturing Company; A. H. Manwaring and wife, The Philadelphia Electric Company; H. T. Paiste and wife, H. T. Paiste Company; Norman MacBeth and wife, illuminating engineer; F. W. Sanford, General Electric Company; J. O. Montignani, Rochester Railway & Light Company; T. H. Yawger, Rochester Railway & Light Company; A. Parshall, Ellenville Electric Company; Stuart Wilder, Westchester Lighting Company; W. E. G. Mitchell, Mitchell-Rand Company; H. Inches, Blodgett & Company; Newton W. Leidy, N. Y. Edison Company; W. W. Freeman, Edison Electric Illuminating Company; T. I. Jones, Edison Electric Illuminating Company; Charles Horstman, United Electric Light & Power Company; Miss Marie Horstman; A. A. Brown, Westinghouse Electric & Manufacturing Company; W. S. Rugg, Westinghouse Electric & Manufacturing Company; T. J. Place, Westinghouse Electric & Manufacturing Company; Phillip S. Dodd and wife, National Quality Lamp Division of General Electric Company; A. W. Hellis, The Westinghouse Machine Company; E. C. Brown, Dearborn Drug & Chemical Works; M. M. Eckhardt, Derby Gas Company; J. Brodie Smith and wife, Manchester Traction, Light & Power Company; Daniel Goss and D. C. Goss, Edison Electric Illuminating Company; F. J. Whitting and wife, Stone & Webster; Charles B. Burleigh and wife, General Electric Company; W. R. Eaton and wife, Cambridge Electric Light Company; James I. Ayer and wife, Simplex Electric Heating Company; Geo. R. Stetson and wife, New Bedford Gas & Edison Light Company; W. J. Keenan and wife, Pettingill-Andrews Company; A. M. Barnes and wife, Cambridge Gas Light Company; D. W. Low of Otis & Hough.

NEW CATALOGUES.

Fancleve Specialty Company have published a new catalogue of electric fittings.

Bulletin No. 136 from the Electric Storage Battery Company is concerned with the development and use of Storage Battery Railway Cars.

Sprague Electric Works of the General Electric Company have issued a neat descriptive pamphlet and price list of Greenfielduct, their new galvanized conduit.

H. W. Johns-Manville Company have issued an interesting pamphlet on the Audifren-Singrun refrigerating machine requiring from ½ to 4 h.p. and forming an ideal load for central stations.

Circular 1194, issued by the Westinghouse Electric & Manufacturing Company, cover Type Q direct current engine driven generators, and describes their construction very fully as well as illustrating the various parts.

The Electric Storage Battery Company has prepared a blue print map of the United States showing the location of their sales offices, depots, construction and operating branches, and inspectors. This exhibits to a remarkable degree this company's claim of a superior service organization.

For the purpose of encouraging the use of "Sunbeam Mazda" lamps, an attractive booklet entitled "Advertising Sunbeam Mazda Lamps in Newspapers" has been prepared for distribution by the Western Electric Company. In it will be found numerous suggestions for advertising copy and appropriate black and white illustrations.

The General Electric Company has just issued Bulletin No. 4939, which is descriptive of Electric Hoists manufactured by that company. Bulletin 4947, is devoted to the illumination of electric railway cars and the advantages possessed by Edison Mazda and Gem lamps for this service. The extent to which electric drive is being applied to the shoe and leather industry, and the advantages to be derived from this application, are shown in Bulletin No. 4931, which contains illustrations and descriptions of various installations of this nature.

A series of intimate views of the Hawthorne works of the Western Electric Company has recently been arranged for post card use and is intended to give the company's friends a better idea of what the "Electrical Capital of America" really is and what is being done there, industrially and socially. The series consist of twelve views showing a general view of the works, the imposing water tower, the telephone apparatus shops, the general merchandise warehouse, the interior of the lead press room in the cable plant, a view showing how cable cores are built up, a corner of the switchboard department, the cord department, an electric motor truck in the warehouse, the brass band which makes good music as well as "quality apparatus," the lunch room with a seating capacity of 3000 and one of the annual field day events of the athletic association.

The Westinghouse Electric & Manufacturing Company has recently issued the following descriptive leaflets describing the various forms of apparatus mentioned below: 2303, Direct Current Crane Motors, detailed and completed views being shown. 2313, No. 907 Commutating Pole Mine Motors. 2314, No. 909 Commutating Pole Mine Motors. 2315, No. 910 Commutating Pole Mine Motors. 2464, Type HD Rheostats for d.c. Motors. 2377, Box Frame Interpole Railway Motor No. 308 B-2 for locomotive work. 2376, Box Frame Interpole Railway Motor No. 321 for use on 600-1200-volt service. 2370, Covers various details of railway motors such as bearings, brushholders, commutators, field coils, etc. 2368, Strap Wound Armature Coils of Westinghouse Railway Motors. This leaflet contains a reprint from the Electric Railway Journal on the subject of "Square Wire or Strap Copper Construction." 2444, Equalizer Fly Wheel Hoisting Sets. This leaflet shows application and diagramatic views of these sets and full explanation of their method of operation. 2393, Covers Westinghouse Dynamotor Compressor for 1200-1500 Volt Direct Current Service.

ELECTRICAL JOBBERS AT DEL MONTE.

The electrical supply jobbers of the Pacific Coast met at Del Monte, Cal., May 30 and 31, 1912. In addition to the usual games of golf and pool an innovation was introduced in the way of "Del Monte Carlo," large sums of "stage" money being risked on the turn of the roulette wheel and the antics of the dice. The prize winners were W. L. Goodwin, Garnett Young and S. P. Russell, of the gentlemen, and Mrs. C. C. Hillis and Mrs. J. A. Herr of the ladies.

The scores in the golf tournament were as follows:

Manufacturers.
(Competing for Jobbers' Cup.)

	Gross.	Hdc.	Net
S. B. Gregory	105	—12	93
*R. F. Oakes	108	—27	81
F. H. Poss	119	—13	106
H. E. Sanderson	97	+7	104
W. H. Seaver	121	—27	94
Garnett Young	125	—27	98
F. F. Skeel	118	—27	91

* Winner.

Jobbers' Cup and Patton Cup.

	Gross.	Hdc.	Net
W. S. Berry	108	+16	124
Theo. Burger	121	—11	110
H. V. Carter	107	—3	104
C. R. Dederick	120	—13	107
A. H. Elliott	130	—6	124
F. B. Gleason	109	+6	115
W. L. Goodwin	103	+13	116
*C. C. Hillis	94	+7	101

* Winner.

The Everready Cup was won by Col. H. V. Carter and the Seaver Cup for low gross score by H. E. Sanderson. Mrs. C. C. Hillis won the ladies' cup offered by the Journal of Electricity.

The Pool tournament was won by W. L. Goodwin who defeated R. D. Holabird in the finals.

Those in attendance were:

Jobbers.

R. D. Holabird, W. L. Goodwin and wife, Frank Fowden, F. V. Averill, T. E. Burger, H. V. Carter, F. B. Gleason, C. E. Wiggin, C. E. Dederick, W. I. Berry and wife, Albert H. Elliott, C. L. Gilson, C. C. Hillis, wife and two children

Manufacturers.

S. E. Sanderson, S. B. Gregory, Garnet Young, Roscoe Oakes, W. H. Seaver, S. P. Russell, J. A. Herr

INTERNATIONAL ELECTRICAL CONGRESS, SAN FRANCISCO, 1915.

Gano Dunn, president of the American Institute of Electrical Engineers, has announced the appointment of the following members of the Committee on Organization of the International Electrical Congress at San Francisco in 1915:

Charles P. Steinmetz ..... President.
Arthur E. Kennelly ..... Vice-President on Program.
C. O. Mailloux ..... Vice-President on International Relations.
W. D. Weaver ..... Vice-President on Organization.
Henry A. Lardner ..... Vice-President on Pacific Coast Relations.
Edward B. Rosa ..... Secretary.
Preston S. Millar ..... Treasurer and Business Manager.
(The above officers constitute the Executive Committee).

Representative Members.

American Electric Railway Association.
Henry W. Blake, Frank R. Ford,
Edwin B. Katte, Henry G. Stott.

American Electrochemical Society.
Charles A. Doremus, Carl Hering,
Willis R. Whitney.

American Physical Society.
Frederick Bedell, Charles F. Burgess,
Edward L. Nichols.

Association Edison Illuminating Companies.
Alex Dow, Louis A. Ferguson,
John W. Lieb, Jr., Joseph B. McCall.

Association of Railway Electrical Engineers.
Jesse H. Davis, Charles R. Sugg.

Association Iron and Steel Electrical Engineers.
Eugene Friedlander, Barton R. Shover.

Alabama Light and Traction Association.
(Names to be announced later.)

Colorado Electric Light, Power and Railway Association.
John F. Dostal, Franklin P. Wood.

Electrical Vehicle Association of America.
William H. Blood, Jr., Frank W. Smith,
Philip D. Wagoner.

Empire State Gas and Electric Association.
Charles R. Huntley, Robert Meredith Searle.

Florida Electric Light and Power Associaton.
(Names to be announced later.)

Illinois Electrical Association.
Ernst Julius Berg, Francis Marion Sinsabaugh.

Illuminating Engineerng Society.
Edwin Pechin Hyde, Van Ransselaer Lansingh,
Louis B. Marks, Addams Stratton McAllister.

Indiana Electric Light Association.
William D. Ray.

International Association Municipal Electric.
William Brophy, Walter M. Petty.

Iowa Electrical Association.
Arthur Hillyer Ford, Louis Bevier Spinney,

Louisiana Electrical Association.
(Names to be announced later.)

Maine Electrical Association.
Henry Wilson Eells, Walter Kierstead Ganong.

Minnesota Electrical Association.
Paul Doty, Henry John Gille,
George D. Shepardson.

Missouri Electric, Gas and Street Railway and Water Association.
(Names to be announced later.)

National Bureau of Standards.
Samuel W. Stratton.

National Electrical Contractors' Association.
(Names to be announced later.)

National Electric Light Association.
Frank Rutter Daniel, Hugh T. Wreaks.

National Electrical Light Association.
Charles L. Edgar, Weldon W. Freeman,
Frank W. Frueauff, John F. Gilchrist,
Samuel Insull, T. C. Martin,
Arthur Williams.

New York Electrical Society.
Henry L. Doherty, George Heli Guy.

Electrical Testing Laboratories.
Clayton H. Sharp.

Franklin Institute.
William C. L. Eglin, Robert Bowie Owens.

Ohio Electric Light Association.
Francis Cary Caldwell, Frank Morrison Tait.

Society for Promotion of Engineering Education.
Henry Hutchinson Norris, Samuel Sheldon.

Institute of Radio Engineers.
John L. Hogan, Jr.

Southwestern Electrical and Gas Association.
Fred Marion Lege, Jr., Arthur Curtis Scott.

Vermont Electrical Association.
(Names to be announced later.)

Western Society of Engineers.
William L. Abbott, Harold Almert.

Wisconsin Electrical Association.
Philip Harold Korst, Roy Henry Pinkley.
(List not complete.)

Pacific Coast Members.

San Francisco.
Allen H. Babcock, George R. Murphy,
Frank G. Baum, Fred F. Barbour,
Augustus J. Bowie, Jr., Charles N. Black,
Charles W. Burkett, Wallace W. Briggs,
Harold W. Clapp, Samuel B. Charters,
Clarence L. Cory, Safford K. Colby,
W. J. Davis, Jr., Herbert W. Crozier,
P. M. Downing, W. F. Durand.
Arthur H. Halloran, Augustus H. Griswold,
George J. Henry, Jr., William W. Hanscom,
Andrew Murray Hunt, George C. Holberton,
S. L. Griswold Knox, Sylvan J. Lisberger,
Sam L. Naphtaly, Wynn Meredith,
Robert Sibley, Earl O. Shreve,
Sidney Sprout, Harris J. Ryan,
Rudolph W. Van Norden, Frank H. Varney.
J. E. Woodbridge.

Los Angeles.
Henry S. Carhart, J. E. Macdonald,
Edwin R. Davis, George A. Damon,
James A. Lighthipe, Orville Hiram Ensign,
Henry H. Sinclair, Ezra F. Scattergood,
E. R. Northmore.

Portland.
Orin B. Coldwell, W. D. Scott,
James A. Cranston, Leroy B. Cramer,
Paul Lebenbaum. Glen E. Kibbe,
W. S. Turner, Henry R. Wakeman,
F. D. Weber.

Seattle.
Magnus T. Crawford, Alvin A. Miller,
Edgar Loew, John Harisberger,
Carl E. Magnusson.

Spokane.
John B. Fisken, D. L. Huntington,
Robert Howes.

Corvallis.
William A. Hillebrand.
Vancouver, B. C.
F. D. Nims, E. M. Breed,
Robert F. Hayward.
Members at Large.

Comfort A. Adams,	Bion J. Arnold,
Howel H. Barnes, Jr.,	Bernard A. Behrend,
Louis Bell,	Charles F. Brush,
Harold W. Buck,	John J. Carty,
Alfred H. Cowles,	Francis B. Crocker,
Samuel E. Doane,	Louis Duncan,
Thomas A. Edison,	Reginald A. Fessenden,
John H. Finney,	W. S. Franklin,
Bancroft Gherardi,	Lester W. Gill,
Winder E. Goldsborough,	L. A. Herdt,
Peter Cooper Hewitt,	John W. Howell,
Henry H. Humphrey,	Cary T. Hutchinson,
Dugald C. Jackson,	Peter Junkersfeld,
Benjamin G. Lamme,	Alexander S. Langsdorf,
William A. Layman,	William S. Lee,
Paul M. Lincoln,	Samuel G. McMeen,
Ralph D. Mershon,	P. N. Nunn,
W. B. Potter,	Michael I. Pupin,
Samuel Reber,	Calvin W. Rice,
E. Wilbur Rice, Jr.,	David B. Rushmore,
A. M. Schoen,	Charles F. Scott,
Charles E. Scribner,	George F. Sever,
Peter William Sothman,	Frank J. Sprague,
G. O. Squier,	William Stanley,
Louis B. Stillwell,	Charles Waterman Stone,
Charles A. Terry,	Elihu Thomson,
George Westinghouse,	Edward Weston,
Scuyler S. Wheeler,	James G. White.

CALIFORNIA ELECTRICAL CONTRACTORS' ASSOCIATION

The Butte Engineering & Electric Company have been awarded the wiring contract for the 15-story building of the Sierra Investment Company at Stockton street and Grant avenue, at about $4500.

The John G. Sutton Company have been given a contract by the same company for a 7-story apartment house at Market and Brady streets, at $5000.

The Decher Electric Construction Company are doing the electric work in the new home of the Great Western Power Company on Post street.

The General Electric Construction Company have been awarded the wiring for the London, Liverpool & Globe Insurance Company's new building on California street.

E. V. Burkhard, the Palo Alto contractor, was in town last Monday.

Billboard displays show that the Pacific Gas & Electric Company and the Electrical Contractors' Association have joined hands in seeking new business.

A real game of baseball on a real diamond for a cup is one of the many attractions to be furnished for the amusement of the Contractors' Convention. Team captains are out after talent and it is rumored that Baseball Manager Boynton has secured a battery that will go to the big league as soon as the game is over.

Don't forget the date July 24-25-26-27.

The advance squadrons of boosters for the Contractors' Convention made a flying trip down the peninsula Sunday. Through the kindness of Messrs. Waldron, Murman, Butte, Levy and Turner, five large autos were filled with members of San Francisco Local No. 1, and an early start was made. Large signs on the rear of each car announced the mission of the party. Secretary Hanbridge provided a lunch at the St. James Hotel in San Jose, which has been selected as convention headquarters. Luna Park was selected for the picnic ground. The members of the committee who went on the trip were: C. F. Butte, Dave Turner, Russ Waldron, N. Hope, L. Levy, W. S. Hanbridge, P. Levy, Geo. Davis, Chick Ames, Jas. Foster, "Pop" Hughes, P. Murman, W. Kohlway, C. Eppestein, Harry Little and Frank Thurber.

A co-operative dinner was given at the Techau Tavern Friday evening, May 24, 1912, by A. W. Bullard, manager of the Great Western Power Company. The table was prepared for 40 guests and not a chair was vacant. The party was made up of Mr. Bullard and the commercial department heads of the Great Western Power Company; Mr. Holberton and the commercial department heads of the Pacific Gas & Electric Company, and the San Francisco members of the California State Association of Electrical Contractors. Mr. Bullard in welcoming the guests told them that it was his aim to bring out a discussion which would bring before the gathering the trouble that it would be necessary to take up and adjust before perfect co-operation could be accomplished. He then called on Secretary Hanbridge who gave a brief history of the California State Association of Electrical Contractors and its work and ambitions to secure co-operation between contractors and central stations.

Mr. Holberton then being called on, gave the contractors a very clear view of why the central station does things and how they helped the contractors. Mr. Bullard then wanted a specified kick registered and Mr. Hanbridge delegated Mr. Aimes of the National Electric Company to demonstrate how it was to the contractors' advantage to get services inside of buildings free and to Mr. Louis Levy to show where it was wrong. Both sides put up strong arguments, and by Mr. Bullard's decision Mr. Levy won the argument. The correction of this evil was passed up to a committee from each power company and from the contractors who will hold regular meetings in the future.

An advertising talk was given by Mr. Bullard and Mr. Myrtle which all present listened to carefully.

TRADE NOTES.

The Oregon Electric Railway Company, Portland, Oregon, has ordered one quadruple equipment of No. 321 motors and HL control from the Westinghouse Electric & Manufacturing Company.

The General Electric Company has sold to the Power Specialty Company two turbine generating units for use in the new garbage incinerators at San Francisco. The rating is as follows: Two C. C. 4, 75 kw., 250 v., 3300 r.p.m., condensing, Curtis steam turbines.

The Tacoma Electrical Machinery Company, 117 South Twenty-fourth street, has been recently organized as a subsidiary company to the Holmes Machinery & Saw Works. The new company has bought the plant and outfit of the H. B. Taylor Company, and is prepared to do all lines of electric work, including repairing and renting of motors, electric light wiring, etc.

The Yuba Construction Company is building, in its shops at Marysville, Cal., two impulse wheels for the Alaska Gastinan Mining Company, which are to be direct-connected to General Electric generators. The wheels, which involve several novel features as to regulating the water, were designed under the supervision of George J. Henry. Lombard governors will be used in the installation.

Pierson, Roeding & Co., have secured a contract from W. L. Holman, who is building the cars for the Geary street municipal electric road, for 45 pairs of trucks, which are to be manufactured by the J. G. Brill Company of Philadelphia. The trucks are described as Brill No. 27, GE. 1. The Westinghouse Electric & Manufacturing Company's motors will be installed on all of the 43 semi-steel cars. The contract calls for 43 quadruple car equipments. Each motor is rated at 50 h.p. at 500 volts. Westinghouse H.L controllers will be used.

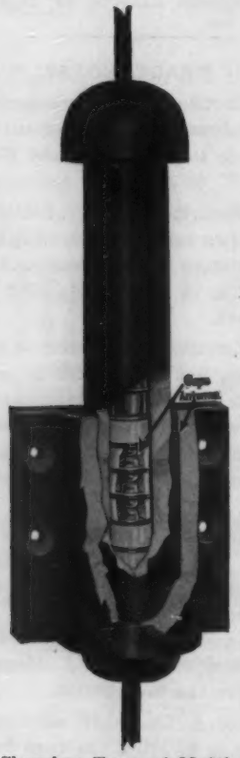
Contracts have been let for the pumping plant of the Snake River Improvement District Company, west of Weiser, Idaho, for aggregate of 400 h.p. Pumping plant will consist of two 150 h.p. motors, direct connected to 12 in. centrifugal pumps, and one 75 h.p. motor, direct connected to a 8 in. centrifugal pump, besides a number of secondary lift pumps. The main pumps will pump against a head of 98 ft. and will be used to irrigate fertile lands of the Ox Flat District. Fairbanks-Morse motors and Byron Jackson Iron Works pumps will be used throughout this equipment.

INDUSTRIAL

NEW LOW PRICED LIGHTNING ARRESTER FOR DISTRIBUTING SYSTEMS.

To meet the demand for a lightning arrester that will give adequate protection to distributing transformers, at a price that will permit its use for even the smallest transformers, the General Electric Company has recently placed on the market a new multigap arrester known as the compression chamber type.

In this new arrester the two conflicting requirements of a successful arrester, namely, ability to discharge at a low potential and prompt cutting off of the generator current have been met with remarkable success. In this arrester as in the older type of multigap arrester, the basis of operation is the rectifying action of the gases in the gaps which extinguishes the dynamic arc. Two special features, the use of antennae and the compression of the gases in the gaps, increase the efficiency of the arrester.



Compression Chamber Type of Multi-Gap Arrester.

The antennae are connected to the ground lead, and extend near, and parallel to, the path across the gaps. By their condenser effect these antennae reduce the potential at which the arrester will discharge, and thus permit the use of a large number of gaps. The large number of gaps and the compression of the gases in an air-tight chamber give prompt extinguishment of the dynamic arc. A series resistance of low value reduces the generator current to a point where it can be safely handled by the arrester.

The insulating case is of porcelain, with all joints filled with waterproof insulating compound. This feature does away with the necessity of enclosing the arrester in a box and aids considerably in reducing the cost of an installation.

The compression chamber type multigap arrester is not intended to supersede the multigap arrester with graded shunt resistance, but simply to meet the demand for a reliable arrester where the more complete protection given by the latter is not necessary and the expense of installing is not justified. The new arrester has been tried out by service laboratory tests and by several months' service on the lines of a large operating company. In all these tests it has thoroughly demonstrated its reliability.

N. E. L. A. CONVENTION SOUVENIR.

An elegant leather-bound eighty-page booklet was the souvenir presented by the National Quality Lamp Division of the General Electric Company, Cleveland, Ohio, to each of the delegates travelling to the N. E. L. A. Convention at Seattle on the six special convention trains known respectively as the "Red," the "Blue," the "Orange," the "Green," the "Pink" and the "Purple." The title of the brochure is "A Little Journey"—reminiscent of certain of Elbert Hubbard's literary works—and its introduction was written by no less person than "Fra Elbertus" himself.

The main text, which follows directly after a brief analysis of present electric train-lighting methods, by Mr. C. W. Bender, consists of terse descriptions of notable points of electrical interest along the routes of the trains, this material being arranged in the form of a diary, with blank lines for memoranda to be filled in by the tourist. The book is profusely illustrated with views of power houses, dams, transmission lines, street lighting installations, etc., selected from a collection of about three hundred such views. These illustrations and data were furnished to the lamp people by the electrical journals, and by central stations, electrical manufacturers, and supply houses all over the country. A map of the United States, drawn with special notations for the purpose, is included. All the illustrations are printed over tints. The souvenir as a whole might aptly be termed a "chose de luxe." The edition was limited to 1000 copies. The fact that so many different interests had an active part in contributing the data for the book is a practical exemplification of the slogan of its donors—"Co-operation, Progress, Quality."

The introduction by Mr. Hubbard reads as follows:

In the year 1876, when I attended scientific lectures at Harvard, a certain professor of physics once explained to us the nature of light.

I had a note book and industriously wrote down the principal points of the address, hoping thereby to memorize what the professor said, in order, if possible, that some day I might be just as wise as he.

Said the learned professor: "There is no light without combustion. There is no combustion without oxygen. When all the oxygen is consumed all light will go out, and that will be Judgment Day. Every form of life then will disappear from the face of the world, and the earth will be like the moon, an extinct planet."

The oxygen has not been consumed up to this writing.

It was not very long ago, that a man at Menlo Park, New Jersey, succeeded in sending a current of electricity through a vacuum. In this vacuum was a small filament, and the current, when turned on, produced a soft, mellow light that illuminated the room.

Light has been produced without oxygen.

Of course, if the inventor had enjoyed the same educational advantages that I had had, he would not have tried his fool experiment, because he would have known beforehand that there can be no light without oxygen.

Once, at the University of Chicago, I was introduced to a great man. This man has written books that nobody understands. And when I came into his presence I was a little

embarrassed, as I always am when meeting great people.

On this particular occasion there suddenly came to my mind a little advice once given to me by my old college chum, J. Robert Crouse. Said Crouse to me one fine day, "Whenever you are in the presence of highly educated people, genuine high-brows, and you feel a little embarrassed and do not know what to talk about, you should talk about electricity. You will never shock anybody. Here is what you will say: "Speaking of Electricity, it is the great mystery; nobody knows what it is; all we see is its manifestation." You can safely say this at any time.

"If you are out to a dinner party and there comes a little lull in the conversation, put this over: 'Speaking of Electricity,' (here cough gently), 'It is the great mystery; nobody knows what it is; all we see is its manifestation.'

"Of course, if you do not know anything about electricity, it would be well here to start something else. But usually the remark goes all right and people put you down as a Weisenheimer."

And so in the presence of the great man in Chicago I was going to say, "Electricity, the great mystery, nobody knows what it is; all we see is its manifestation"—I was going to say it, when, would you believe it, he said it.

"Good-bye," I said; I knew he had fixed his gun, and this was all he had to offer, and so I made my sneakerino.

I ran down the steps and caught a trolley car, jumping on the front end. As I stood there by the motorman, a little behind him, I saw a sign over his head, "Do not talk to the Motorman." This suggested an interview, and so I said, "Partner, what is Electricity?"

"It's the juice," he said without an instant's hesitation.

"Yes, I know something about electricity," he added. "It's God's best gift to man."

"I thought woman was God's best gift to man," I ventured.

"Same thing," he answered, "Electric manifestation, the great mystery; nobody knows what it is; very dangerous if you do not know how to handle it!"

"I get off there at the next corner," I said.

The car stopped within a foot of the crossing, and as I stepped off on terra cotta, I said, "Good-bye, my friend."

"Good-bye, old man," he said. But he never even looked up at me. He didn't know that I was one of the great literary lights of the world—neither did he care a snap. He was just intent on carrying that car through in perfect safety. He saw everything and nothing; and as the car moved away I said to myself "There goes an educated man. He is on his job."

We say that electricity is everywhere in the atmosphere, but this is an assumption that passes for knowledge since no one can refute you.

Electricity has never been placed under the microscope; it has not been weighed in the scales; chemical tests fail to find it.

A wire that is charged with electricity looks exactly like a wire that is not charged.

Franklin caught it on a kite, but did not succeed in his endeavor to bottle it. All he caught was a cold.

We say that electricity travels. But this, too, is only a figure of speech, and a variation of the good old bromide that "All we see is its manifestation"

Yet we manipulate this particular medium of energy which we call electricity. We know some of the things we can do with it and we know a few of the things we cannot do with it.

Egypt, Assyria, Greece, Rome—great civilizations all—went down to dusty death, knowing nothing of electricity.

The whole science of electricity has been born, practically, within our own time and no man can say what the final achievement of the electrician will be.

Electricity is a phenomenon, just as man is a phenomenon.

Electricity is a form of attraction and repulsion; of give and take; of absorption and dissipation.

We believe that the life of man is an electric manifestation. We know that the man, as Walt Whitman said, "isn't the proposition that is contained between your boots and your hat, because this one hundred and seventy pounds of fluid gas and solid which we call a man can be emptied by a single dagger thrust of its power in an instant, and the thing left is not a man."

What is it that takes flight? We do not know. Is man a transformer? I think yes.

Electricity is the boundary line between the material and the spiritual. It is the most spiritual thing with which commerce has to deal, because it is an unseen thing. Yet it can be sold, measured, and delivered, but you cannot sell it on the basis of "goods returnable if not satisfactory." There are court records which show that it has been stolen.

The electrician deals with one of the most subtle secrets of God. His knowledge and his ignorance should keep him reverent.

The business of the electrician is to produce light, heat and power at will, rendering these things serviceable and safe for the use of man at the minimum of cost.

The electrician handles Truth in its most subtle form; because electricity occupies the twilight zone between soul and mattter. He concentrates the unseen intelligence and hands it over to the housekeeper for a consideration.

Electricity binds the earth together, for by its use we can put a girdle around the world in less than eight minutes, and because Shakespeare had Puck say he could do this in forty minutes, critics have said that Shakespeare guessed what Kelvin proved. Electricity is the very medium of co-operation in the broad modern sense. It has exterminated a thousand miserable and costly strifes and jealousies.

Electricity is the universal symbol of co-operation in Nature, so electricians should in their lives symbolize the Brotherhood of Man.

We disciples of Jove are public servants. We are not looking for an easy time. We know that the reward of good work is harder work and more of it.

Just now, you are having a brief play-spell; but it is only that you may recharge your batteries, and go back and turn the current on to a harder job.

Electricians are setting the world a pace in several respects. That hustling fraternity known as the "Sons of Jove," is one of the leaders in the race.

It's "All Together, All The Time, For Everything Electrical."

And it looks to me that everything is electrical. Certainly everything that has life, and everything has, even death.

I am glad to be on the wire with an organization that lays its course by the stars and is working in line with the forces of Nature, with the winds, the sunshine, the rain, and the all-enfolding night.

If we were to define the business of Deity we would say that He is an Electrician.

Yes, God is the Great Electrician.

He is the only one who understands the business.

He, alone, has a knowledge of this unknown thing of which we so glibly prate. It is His pet, His plaything, His joy, His pride!

This Little Journey into Universal Ignorance, upon which I hold no copyright, and as to which I have never been accused of violating the Sherman Act, is written just for the divertisement and amusement of my dear friends, the boys and girls who are attending the Convention at Seattle.

I want them to regard it as a compliment on my part to that enterprising organization whose slogan and ideal are "Co-operation, Progress, Quality,"—a slight token of my esteem for this organization and for those who are at its head.

NEWS NOTES

INCORPORATIONS.

LOS ANGELES, CAL.—H. F. Woodill, founder of the Woodill & Hulse Electric Company, has purchased the interest of H. T. Duff in the business and will re-incorporate and enlarge its scope.

SANTA ANA, CAL.—Articles of incorporation have been filed by the Chapman Avenue Water Company of Orange. It will furnish, buy and sell domestic and irrigation water. Capital $20,000.

SACRAMENTO, CAL.—The Big Four Electric Railway Company, a $500,000 Tulare county corporation, has filed articles of incorporation to build from Tulare to Woodville, thence to Popular, thence to Porterville, and a branch line will run from Tulare to Visalia, making the main line and the branch thirty-four miles long.

ILLUMINATION.

PORTERVILE, CAL.—The Mt. Whitney Light and Electric Company has submitted an application for a franchise within the incorporated limits of the city.

LINDSAY, CAL.—C. B. Morganthaler has been granted a franchise for a period of 50 years to operate an electric system upon or under the streets and alleys of the city.

RICHMOND, CAL.—The Pacific Gas & Electric Company has completed arrangements for the installation of a complete distributing system for the Santa Fe section of the city.

SANTA BARBARA, CAL.—The Lompoc Gas & Electric Company of Santa Barbara County has asked permission to issue $75,000 in bonds, $50,000 on its plant and $25,000 on extensions.

EPHRATA, WASH.—The City Council has granted Martin Kramer and T. G. Anderson of Seattle a franchise for installing a 300 h.p. lighting plant to furnish light and power to Ephrata Valley.

SAN LUIS OBISPO, CAL.—Sealed bids will be received up to July 2, 1912, for the sale of a franchise applied for in the county of San Luis Obispo, for a period of 50 years to operate an electric system upon certain public highways in this county.

LOS ANGELES, CAL.—F. Yoker, manager of the American Graetzin Light Company, has asked for permission to make a demonstration of the Graetzin gas lights for the purpose of showing their alleged superiority over electricity for the purpose of street lighting. The subject was referred to City Electrician Manahan.

MONTESANO, WASH.—In the interest of a company promoting a new system of manufacturing illuminating gas, S. S. Silvis, of Aberdeen appeared before the City Council and requested that a franchise be issued to his company to operate a gas plant in this city. Matter referred by the council to the light commission for investigation and a report will be made at a later meeting.

OAKLAND, CAL.—Fred C. Turner, Commissioner of Public Health and Safety, has filed with the City Council a lengthy report of his investigations into the charges preferred by the Central Oakland Light & Power Company, which alleged that its bids for supplying the city with electric lights in District No. 5 were unfairly treated. Commissioner Turner explains that the bids submitted by the Central Oakland Light & Power Company, although lower in some particulars than those of the Pacific company, the saving of money to the city by accepting the former concern's bid would be so small as to be of no consideration when compared with the disadvantage resultant from awarding the contract to this concern. In conclusion, Turner reiterates his recommendation that the Pacific company be given the contracts for the service in all of the districts of the city.

SAN FRANCISCO, CAL.—The Railroad Commission has set June 12 as the time for the hearing of the complaint of the Mt. Whitney Power & Electric Company vs. the Tulare County Power Company, and the San Joaquin Light & Power Corporation. The session will be held in Porterville at 10 a. m. The hearing was granted on the application of the Mt. Whitney company which filed with the Commission a complaint against the Tulare and also the San Joaquin companies, under the provisions of the new public utilities act which provides that a corporation before doing business in a new territory must obtain from the Commission a "certificate of convenience and necessity," asking that such certificate be denied. Both companies made formal reply that the public convenience and necessity called for their entrance into the territory. The Mt. Whitney company has also asked to be allowed to modify its standard meter so one may measure for several motors.

SAN FRANCISCO, CAL.—Some confusion has been caused by the announcement that $3,000,000 new common stock of the Pacific Gas & Electric Co., sold to stockholders pro rata at $60 a share, will not be entitled to participate in the July dividend. The new stock will be issued as of June 17, while the books close for the dividend of $1.25 a share on the common stock of June 15. The new stock is to be paid for in five installments, the first being due May 20. In the circular announcing the issue of the new stock it was stated that stock could be paid for in full on any installment date, when certificates would be issued for full amount of stock paid for. Several houses in New York purchased large amounts of the warrants for the new stock and forwarded them to the office of the company here, with drafts for full amount of new stock. These houses held that stock should be issued to them of date of May 20, as they had made full payment on first installment date, instead of paying in five installments. It is held by the company, however, that all new stock will be issued as of June 17, two days after the books close, so purchasers of the warrants will not get a dividend on their stock until October. The fact that the new stock will not share in the July dividend has caused some decline in Pacific common.

TRANSPORTATION.

SAN BERNARDINO, CAL.—Entrance of the Pacific Electric Railroad into San Bernardino from Los Angeles over the public streets has been granted over the protest of property owners.

SACRAMENTO, CAL.—The Sacramento Valley Electric Railroad, incorporated to operate between Red Bluff and Dixon, has filed a petition with the Railroad Commission for permission to issue 300,000 shares of preferred stock at $100 a share and 20,000 shares of common at $100. The money from the latter is to be used, according to the petition for purchasing rights of way. The company declares it intends to pay 20 per cent commission to its stock sales agents.

TULARE, CAL.—In a statement issued by the Big Four Electric Railway details are given as to the financing of the project, the directors, length of road, etc. There will be 19 directors, five from Tulare, five from Visalia, five from Porterville, two from Woodville and two for Poplar. The road will be 41 miles long. The road will be financed by the Avery Investment Company of San Francisco, which will raise the money over and above what is locally subscribed.

The road, it is declared, will earn, approximately $13,000 per mile per year, and the construction will be $15,000 per mile.

MARTINEZ, CAL.—Thirteen suits to condemn rights of way for an electric line between Bay Point and Pittsburg, Contra Costa County, have been filed here by the Oakland & Antioch Railway. The present terminus of the electric line is at Bay Point and as soon as the rights of way have been obtained the line will be extended to Pittsburg, from which point it will cross the Sacramento via Chipps Island. The defendants in the actions instituted here are Thomas Thormey, James H. Wilson, F. E. Valch, Fannie Cunningham, Henry Ohara, Charles N. Wight, Chas. H. Wight, B. R. Banning, John Ohara, David Bartnett, the Morton Company, Bay Shore Land Company and the Bay Point Realty Company.

WASHINGTON, D. C.—William M. Abbott, general attorney for the United Railroads of San Francisco, appeared before the U. S. Supreme Court in the matter of the United Railroads of San Francisco against the city and county of San Francisco. The question before the U. S. Supreme Court is on an application for a writ of certiorari to review the judgment of the Circuit Court of Appeals for the Ninth District. The point involved is the right of the city of San Francisco to operate cars over lower Market street and for ten blocks on Point Lobos avenue. The case was submitted to the full bench, but, inasmuch as the court adjourns on June 10 until the first Monday in October, a decision at the present session is improbable.

TRANSMISSION.

ASTORIA, ORE.—Surveyors are in the filed now laying out a line from here to Seaside for the proposed electric line to be built by Mr. Robinson.

ALBANY, ORE.—Track laying on the Salem-Albany extension of the Oregon Electric Railway has been completed to Albany and regular electric traction service will soon be established to Portland.

CORVALLIS, ORE.—Construction work on the street car railway in this city by the Portland, Eugene & Eastern has started and is being pushed as fast as possible. The road is a standard gauge line.

CITY OF MEXICO, MEX.—Steps will be taken toward the erection of a big plant which will generate 65,000 horsepower. The Mexican Hydroelectric Company, capitalized at $30,000, will handle the concession.

LOS ANGELES, CAL.—The Southern California Edison Company has been granted permission to issue new bonds to the amount of $4,117,000. It was stated in the application that these bonds were to be exchanged for others previously issued and outstanding.

PORTLAND, ORE.—A force of electricians have started work on the electrification of the Southern Pacific's West Side lines between Portland and McMinnville, being employed in overhead construction, bonding and other work necessary to the electrification of the road.

EUGENE, ORE.—Plans for the development of 12,000 to 14,000 horsepower at Martin's Rapids on the McKenzie River, 33 miles east of Eugene, are being made by the Oregon Power Company, and surveying parties in charge of C. B. Nichols, chief engineer, now being at the rapids.

ALTA, CAL.—The Pacific Gas & Electric Company has started work clearing a right of way for the power line which is to be run from the Alta power house to Lake Spaulding. This line is to furnish power for the machinery to be used in the construction of the new dam, work on which has already commenced.

MONTGOMERY, CREEK, CAL.—The Mount Shasta Power Company is pushing work on its power development in the Big Bend of Pit River. Men are working at both ends of the tunnel that is to be six miles in length when completed. W. A. Cooper, manager of the company, who is on the ground, says the working force will be increased right away so that the tunnel will be driven at the rate of 400 feet a month. The length of the completed portion of the tunnel is half a mile.

SAN BERNARDINO, CAL.—The plant of the Southern Sierras Power Company is now completed and in operation, furnishing light and power in this city. Until the completion of the plant, the company has been using the old Lytle power plant, bought from that company some months ago. Work on the long power line from this valley to Bishop, in Inyo county, is steadily progressing. The steel towers are now structed from this city to a point far out on the desert, and the actual stringing of the copper is now under way.

DORRIS, CAL.—Within the next two months the giant power line being constructed from Dorris to Klamath Falls by the California & Oregon Power Company will be completed to Klamath Falls. The cement foundations for the power poles are built from Dorris towards Klamath Falls as far as Worden near the Lower Klamath Straits. These cement foundations are being placed every 500 feet. The power poles are set in pairs and a cross will then be attached to them very securely and the whole will be guyed with the power lines themselves. The line is following the Southern Pacific right of way to the Raemes ranch four miles south of Klamath Falls, where it will cross the Klamath Falls and follow the west shore of the river and Lake Ewauna to the present power station on Link River in the city of Klamath Falls.

TACOMA, WASH.—On the ground that the vested rights of the Sumner Lumber Company, a $40,000 concern on the White River, have been jeopardized by the construction of the Pacific Coast Power Company, a $12,000,000 power plant at Lake Tappe, and Dieringer, Judge Card of the Superior Court signed a judgment giving the lumber company damages in the sum of $1000 and enjoining the power company from diverting the water of the White River to Lake Tapps. The power company immediately filed notice of appeal to the Supreme Court. Judge Card's decision means in effect that the big power plant cannot be operated if such operation requires all of the water of White River. Judge Card holds the river is navigable for floating logs and single bolts and the plaintiff as a boom company acquired vested rights on the stream before the Stone & Webster interests began to use the water.

TELEPHONE AND TELEGRAPH.

MILES, WASH.—The Local & Long Distance Telephone Company, headquarters at Davenport, is building a line north of Davenport to old Fort Spokane and will connect with Miles about July 1.

PHOENIX, ARIZ.—The Pacific States Electric Company of San Francisco has applied for a receiver for the Overland Telephone & Telegraph Company, which operates an extensive system in Phoenix and Northern Arizona. The assets of the Overland are given at $430,000, with liabilities of $700,000.

PHOENIX, ARIZ.—The Bell Telephone Company has offered the Arizona Telephone & Telegraph Company $2,000,000 for its system, which connects Phoenix, Prescott, Tucson, Bisbee, Tombstone, Globe and Yuma. The property also includes a toll line extending through the Imperial Valley to Los Angeles. The stockholders of the Arizona company will meet in Tucson June 15 to accept or reject the offer.

OLYMPIA, WASH.—The public service commission has entered a formal order authorizing the stipulation between the Puget Sound Independent Telephone Company and the Independent Telephone Company, the Sunset Telegraph & Telephone Company and the Northwestern Long Distance

Telephone Company, by which the Bell concerns agree to give the patrons of the Puget Sound country long distance service over its lines.

SANTA ANA, CAL.—The City Trustees and officials of the Pacific Telephone & Telegraph Company have come to an adjustment of their differences and as a result the city will offer a telephone franchise for sale, the Pacific company to bid upon it. The company paid $2000 into the city treasury as a compromise sum for back taxes; that is, money that would have come to the city had the company been operating under a franchise. Two per cent of the gross receipts from January 1, 1912, is to be paid later.

BAKER, ORE.—Richland has solved the problem of communication with the outside world by installing a wireless system. The town is in Pine Valley, 60 miles from here, and has been unable to get a company to put poles into that district and therefore has been unable to keep in touch with the world except by mail which runs every other day from here and takes a day for delivery. Taking the matter in their own hands, the citizens organized a company and have secured the wireless apparatus which they are now installing.

PASADENA, CAL.—The City of Pasadena has filed with the State Railroad Commission a petition of intervention in the case now pending before the Commission concerning the proposed merger of the Pacific Telephone Company and the Home Telephone Company of that city. The city asks that in case assent is given to the consolidation such conditions be imposed as will definitely assure the people of Pasadena an adequate service within the limits of the municipality, and also proper long-distance telephone facilities. It further asks that any consent the Commission may give be conditioned upon the ratification of the people of Pasadena.

ALHAMBRA, CAL.—The Pacific Telephone & Telegraph Company last week sent the City Council a draft for $926.10, in payment for the use of the city streets for a period of over three years. The payment was made under the working agreement with a former council, in lieu of a franchise. For some time the Pacific has been trying to get a franchise to continue operations in this city. The move has been opposed by a large number of citizens who have signed petitions requesting the council to refuse the franchise and to compel the company to consolidate with the Home Telephone Company which has a grant to operate in Alhambra. The draft presented the council is 2 per cent of the gross receipts of the company covering the period from December 15, 1908, to March 31, 1912.

LONG BEACH, CAL.—The local telephone companies will be required as a result of the passage of an ordinance by the City Council, to furnish detailed statements under oath showing the number of telephones owned by the companies and in operation, the rate charged by each telephone company, the total receipts for local telephone service for each month, the monthly long-distance charges for the last 12 months preceding June 1 of this year and all revenues derived from all sources. The ordinance also requires the telephone companies to give a statement in detail showing the number of poles, quality and amount of wire on hand and in use, number and extent of conduits under ground, description of real estate, buildings, furniture, equipment and other personal property, and the aggregate value of plants and properties. There is further required an itemized statement from each company of all expenditures made for supplying telephone service to the city of Long Beach and its inhabitants for the period of 12 months next preceding June 1.

WATERWORKS.

VENICE, CAL.—The People's Water Company has sold its plant to the Funding Company of California, a Los Angeles corporation.

PASADENA, CAL.—The date of the water bonds election has been set for June 27, and the amount of bonds to be voted on as $1,250,000.

SAN DIEGO, CAL.—The City Council has passed a resolution favoring 320 bonds of $1000 each, and 40 at $500 each for water extension and repair fund.

SPOKANE, WASH.—Contracts for the water main extensions in the Manito Heights Addition were awarded by Elmendorf & Elmendorf to A. Wold, the bid being $9750.

COEUR d'ALENE, IDAHO.—The ordinance providing for the purchase of the water plant from the consumers' company for $180,000 passed the council at its second reading.

SANTA MARIA, CAL.—The Domestic Water Company of Santa Maria will sell all water by meter rates from July 1. For fire protection a new high pressure pump is to be installed.

REDLANDS, CAL.—In a hard fought election the municipal water bonds were voted 5 to 1. The election authorized the bonding of the city to the amount of $600,000 for the acquisition of a municipal water system.

LOS ANGELES, CAL.—The Public Service Commission has authorized the commencement of construction on the aqueduct distributing system. If the plans mapped out by the Commission are carried through, the aqueduct will deliver Owens River water to the city simultaneously with the completion of the rest of the system. Briefly, the Commission authorized Chief Engineer Mulholland to do the following: "Proceed forthwith to begin work on the Franklin Canyon to Engineer Mulholland's statement. Figure on bringing the water from the Fernando reservoir to Franklin Canyon, and thence through the Cahuenga district to Inglewood and Redondo, through a six-foot steel pipe-line, a distance of 20 odd miles, the cost of which will exceed $1,000,000. Submit figures as to the cost of extending the arms from the main trunk to Los Angeles, Pasadena and other districts. Secure easements for the right of way for the pipe line, as above stated. (There is only 6500 feet of right of way required, as the balance of the district is covered by highways and dedicated streets, under which the State law enables the Commission to run its pipe line.) The easements are also to permit the city to run its electric power distribution system."

OAKLAND, CAL.—The second step in the formation of a municipal water district on the east side of the bay, looking to the acquisition of the plants and water-bearing properties of the Peoples Water Company and the Bay Cities Water Company by the allied municipalities, was taken, when B. H. Pendleton, chairman of the Oakland Water Commission, filed with Mayor Frank K. Mott a comprehensive report of the investigations of the commission. The cities interested in the water district are Oakland, Alameda, Berkeley, Alvarado, San Leandro, Piedmont, Albany and Emeryville. Mayor Mott will at once call a third conference of the mayors proposed water district. The result of the commission's instruction will cost in the neighborhood of $70,000, according of the eight municipalities which are to be included in the tunnel. This will be nearly 4000 feet in length, and its conv[illegible]estigations will be set forth in a report, and the third step will be taken, that of authorizing the circulation of petitions to the Alameda County Board of Supervisors demanding the call[illegible] of a spe[illegible]al election, at which the citizens are to vote on the formation of a water district. The Oakland Water Commission consists of B. H. Pendleton, chairman; George W. Dornin and W. T. Veitch, and their investigations have extended nearly two years. The report gives in detail every item of information regarding valuations, production, cost of installation, equipment, etc., which can be of any use in working out the scheme for the formation of the municipal water district and the acquisition, by purchase or condemnation proceedings, of the properties of the two water companies.